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ORIGINAL COMMUNICATIONS.

“A body of men engaged in the same pursuit, form a joint stock of their information and experience, and thereby put every individual in possession of the sum total acquired by them all.”—REV. DR. WILLIAM CAREY.

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M.DCCC.LIX.

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Jogenderchunder Roy, Rajah, Zemindar, Sharatooly near Serampoor,	1858
Johnson, Edward, Esq., Narcoolbarea, vid Merai,	1856
Johnson, John, Esq., Merchant, Calcutta,	1856
Johnson, P., Esq., Merchant, Calcutta,	1846
Johnstone, Capt. H. C., Revenue Survey, Punjab,	1862
Johnstone, W. Esq., Civil Service, Allahabad,	1857
Jotendromohun Tagore, Baboo, Calcutta,	1858
Joygopal Bysack, Baboo, Calcutta,	1858
Joygopal Mullick Baboo, Merchant, Calcutta,	1858
Joykissen Mookerjee, Baboo, Zemindar, Ooterparah, ..	1852
Judge, W. J. Esq., Solicitor, Calcutta,	1858
Judge,† Spencer, Esq., Solicitor, Supreme Court,	1843

KALEE PRASOHO Sing, Baboo, Calcutta,	1857
Kalee Comar Dey, Baboo, Merchant, Calcutta,	1858
Kelner, G. F., Esq., Burdwan,	1858
Kemp, F. B., Esq., Civil service, Backergunge,	1856
Kendal, B. Esq., Civil Surgeon, Balasore,	1858
Kenny, T., Esq., Indigo planter, Salgamudea, Commercolly,	1852
Ketromohun Chatterjee, Baboo, Asst. Civil Auditor, Calcutta,	1858
Khalutch Chunder Ghose, Baboo, Calcutta,	1857
King, Arthur Kaye, Esq., Merchant, Calcutta,	1858
King, Robert, Esq., Sub-Deputy Opium Agent, Patna,	1850
Kinleside, Lt.-Col. R. R., (Artillery,) Meerut,	1847
Kissenkishore Ghose, Baboo, Pleader, Sudder Court, Calcutta,	1853
Kistogopal Ghose, Zemindar, Calcutta,	1853
Knowles, H., Esq. Merchant, Calcutta,	1852
Knox, T. J., Esq., Madras Civil service, Vizagapatam,	1858
Knyvett, Lt.-Col. W. J. W. (31st Lt. Infy.,) Mussooree,	1851
LAMB, Major Wm., (51st Regt. N. I.,) Dy.-Assist.-Adjt.-Genl., Saugor Division,	1847
Landale, R. B., Esq., Indigo planter, Dheerce <i>via</i> Shergotty,	1853
Landale, Walter, Esq., Indigo planter, Lutteepore factory, Bhagnulpore,	1851
Lance, C. E. Esq., Civil service, Mymensing,	1858
Lane, Major-Genl. J. T., C. B., Nainee Tal.,	1851
Lane,† T. B., Esq., Civil service,	1855
Larkins, T. P., Esq., Civil service, Chittagong,	1853
Larmour, R. T., Esq., Indigo planter, Mulnauth, <i>via</i> Bongong,	1848
Lauder, Richard, Esq., Merchant, Calcutta,	1856
Lautour, E. F., Esq., Civil service, Patna,	1847
Lautour, Edward, Esq., Civil service, Calcutta,	1851
Lee,† H. J., Esq., Depy.-Secy., Bank of Bengal,	1851
Leonard, H., Esq., Supt. of the Mutlah,	1858
Levinge, H. C., Esq., E. I., Railway Dept., Colgong,	1855
Lewis, W. T., Hon'ble, Resident Councillor, Penang,	1840
Lind,† F. M., Esq., Civil service,	1851
Lindsay, D. B., Esq., Merchant, Calcutta,	1855
Little,† Lt.-Col. Archibald, (H. M. 9th Lancers,)	1853
Lloyd, Major-Genl. G. W. A., C. B.,	1838
Loch, George, Esq., Civil service, Calcutta,	1852
Loch, J. A., Esq., Civil service, Agra,	1852
Login,*† Sir J. S., Medical service,	1843
Lomer,† Major W. H., (1st Regt. N. I.,)	1854
Long, The Rev. James, Church Missionary Society, Calcutta,	1855
Lougden, E. H., Esq., Agra,	1854

Lord, G. T. Esq., Manager, Bengal Coal Company,	1858
Low,† The Hon'ble Major-Genl. J., C. B.,	1854
Lowther, Capt. W. H., (1st Assam, Lt. Infy.,) Debrooghur,	1856
Lowther,*† Robert, Esq., Civil service,	1836
Lumsden, Capt. P. S., Dy. Asst. Qr. Mr. Genl., Peshawur,	1851
Lushington, Edward, Esq., Civil service, Calcutta,	1848
Lyall,† John, Esq., Merchant,	1849
MacCrea, R., Esq., Commissariat Dept., Thyet-Mhew,	1856
Macdonald, A. G., Esq., Civil service, Rungpore,	1852
Macdonell, Capt. A. A., (40th N. I.,) Poosa, Tirhoot,	1855
Mackay, R. B., Esq. Merchant, Calcutta,	1858
Mackenzie, Brigr. J., (8th Lt. Cavalry,) Ferozepore,	1851
Mackenzie, H. Esq., Indigo planter, Jingergetchie, Jessore,	1850
Mackenzie, W. L., Esq., Deputy-Magistrate, Serajgunge,	1858
Mackey, D. C., Esq., Merchant, Calcutta,	1854
Mackinnon, Lieut. W. C., H. M. 87th Fusiliers, Gyah,,	1858
Mackintosh,† George, G., Esq., Civil service,	1838
Mackintosh,† Aencas, Esq., Indigo planter,	1849
MacLagan,* Frederick, Esq., Indigo planter, Kishnaghur,	1837
Maclean, A. Esq., Civil service, Kishnaghur,	1858
Macleod, George, Esq., Rajapore Factory, Rajshaye,	1858
Macnair,† George, Esq., Indigo planter,	1851
Macpherson,*† George G., Esq.,	1836
Mactier, T. B., Esq., Civil service, Poorec,	1846
Maharaj* Dheraj Matabchunder Bahadoor, Rajah of	
Burdwan,	1836
Maharajah of Cooch Behar,	1856
Malchus, G., Esq., Merchant, Calcutta,	1852
Malet, O. W., Esq., Civil service, Beerbhoom,	1857
Main, Richard, Esq., Merchant, Calcutta,	1858
Manderson,† Robert, Esq., Civil service,	1855
Mangles,† J. H., Esq., Civil service,	1858
Manickjee,* Rustumjee, Esq., Merchant, Calcutta,	1837
Mansell,† Charles Grenville, Esq., Civil service,	1837
Menzies, T., Esq., Merchant, Mirzapore,	1858
Marquis, J., Esq., Indigo planter, Pubna,	1839
Marriott,† Major E., (57th N. I.,)	1852
Marshall, F. C., Esq., Asst. Civil Engineer, Dinapore,	1854
Martin, Major T., Offg. Presy. Pay Master, Calcutta,	1852
Martin, Simon N., Esq., Civil service, Lucknow,	1855
Maseyk, Henry, Esq. Neemtolla, Moorshedabad,	1858
Maseyk, J. W., Esq., Indigo Planter, Jungypore,	1858
Mason,† Lt. C., Crauford, (48th M. N. I.,)	1853
Mason, Capt. James, Darjeeling,	1858
Masters*, J. W., Esq., Assist.-Commissioner of Assam,	
Golah Ghat,	1835

	<i>Admitted.</i>
Mathie*† Lt.-Col. James, (21st N. I.)	1836
Maunsell, Lt. F. R., Engineers, Roorkee,	1855
Maxwell, David, Esq., Indigo planter, Futteyghur,	1852
May,† George, Esq., Merchant,	1857
McCallum,† D., Esq., Merchant,	1836
McDonell, E., Esq., Sub-Deputy Opium Agent, Chumparun, Tirhoot,	1842
McLeod, Donald Friel, Esq., Civil service, Finl.-Com. of the Punjab, Lahore,	1836
Meares, Geo., Esq., Indigo planter, Sindoorree, Jessore,	1855
Mercer,* G. G., Esq., Indigo planter, Futteyghur,	1846
Miles, Capt. C. W., (Com. 3rd Regt. Oude Irregular Infy.,) Azimghur,	1857
Miller, Edward, Esq., Merchant, Calcutta,	1856
Mills,*† Andrew John Moffat, Esq., Civil service,	1836
Mills, R. Esq., E. I. Railway, Howrah,	1858
Mohr, Edward, Esq., Merchant, Arracan,	1857
Molloy, R., Esq., Attorney, Supreme Court,	1842
Monckton, H., Esq., Civil service, Simla,	1847
Moncrieff, R. S., Esq., Bank of Bengal, Calcutta,	1858
Money,*† William James Henry, Esq., Civil service,	1836
Montgomery, R., Esq., C. S., Judicial Commr. of Lucknow,	1853
Morgan, R. B., Esq., Civil service, Agra,	1852
Mornay, H., Esq., Secretary Assam Company, Calcutta,	1843
Morrell, R., Esq., Zemindar, Backergunge,	1853
Morrieson, Major R., Political Agent, Bhurtpore,	1853
Morris,† James, Esq., Merchant,	1855
Morton, Capt. William Elliot, (Bengal Engineers,) Roorkee,	1851
Mouat, Dr. F. J., Inspector of Jails, L. P.,	1856
Murdoch, H. H., Esq., Merchant, Calcutta,	1858
Murray, Capt. James, Mussooree,	1855
Murray, J. C., Esq., Calcutta,	1856
Murray, Lt. C., Commg. Sebundy Sappers, Darjeeling,	1855
Muspratt, J. R., Esq., Civil service, Bhaugulpore,	1847
NAESMYTH, J., Esq., Civil service, Punjab,	1852
Nilmoney Muttyloll, Baboo, Calcutta,	1858
Nicol, F. A. M., Esq., Chowkeedangah, Mungulpore,	1851
Nuthall, R. D., Esq., Assist. Supt. Kheddahs, Deebroghur,	1858
OAKES, Capt. W. H., Deputy-Commissioner, Chota Nagpore,	1857
O'Brien,† Captain Wm., (8th Regiment Nizam's Infantry,)	1846
O'Brien, E. H., Esq., Calcutta,	1858
Oboychurn Goho, Baboo, Merchant, Calcutta,	1856
Ockelton, T. P., Esq., Calcutta,	1856
Oliva, L. B., Esq., Merchant, Calcutta,	1857

Omachurn Mittra, Baboo, Merchant, Calcutta,	1857
Onraet, P. T., Esq., Bhaugulpore,	1857
Onseley, † Major R.,	1845
Outram, the Hon'ble. Lieut.-General Sir James, Bart., G. C. B., Member of the Supreme Council, Calcutta,	1855
Owen, Capt. W. G., (11th Madras N. I.,) Nursapatam, near Payakerowpett,	1846
PALMER, R. S., Esq., Merchant, Calcutta,	1844
Palmer, Charles, Esq., Medical service, Howrah,	1848
Palmer, Dr. W. J., Civil Surgeon, Ghazee pore,	1856
Palmer, A. V., Esq., Civil service, Tirhoot,	1858
Parish, Revd. Charles, Chaplain of Moulmein,	1856
Parry, John, Esq., Merchant, Calcutta,	1856
Parsons, Major-Genl. James, C. B., (50th Regiment, N. I.,) Commanding Rohilkund District, Bareilly,	1838
Paterson, C. Esq., Indigo planter, Colgong,	1858
Paul, G. C., Esq., Barrister-at-law, Calcutta,	1856
Peacock, the Honorable Barnes, Legislative Member of the Supreme Council, Calcutta,	1852
Pearson, E. S., Esq., Civil service, Sylhet,	1852
Peary Chand Mittra, Baboo, Secretary Public Library, Cal- cutta, (Vice-President,)	1847
Peary Mohun Chowdry, Baboo, Zemindar, Calcutta,	1858
Pereira, † Francisco, Esq., Merchant,	1850
Pertap Chunder Sing, * Bahadoor, Rajah, Zemindar, Pakpara,	1847
Peskett, William, Esq., M. D., Civil Surgeon, Simlah,	1856
Peterson, A. T. T., Esq., Barrister, Supreme Court, Calcutta,	1849
Phayre, Major A. P., Commissioner of Pegu,	1841
Phillippe, Clement, Esq., Indigo planter, Balacole, Pubna,	1851
Phillips, James, Esq., Indigo Planter, Dhoolorry factory, Pubna,	1858
Pittar, C. J., Esq., Calcutta,	1857
Poe, † H. H., Esq., Solicitor,	1854
Pogose, J. G. N., Esq., Zemindar, Dacca,	1856
Pogson, Lieut. J. F., Invalid Establishment, Simla,	1856
Pottit Pabun Sen, Baboo, Merchant, Calcutta,	1847
Power, Capt. E. H., Dy.-Judge-Advocate-Genl. Rangoon,	1856
Prankissen Mookerjee, Baboo, Merchant, Calcutta,	1858
Preonauth Sett, Baboo, Calcutta,	1852
Prestwick, E., Esq., Merchant, Calcutta,	1858
Price, † J. O., Esq.,	1843
Prinsep, H. T., Esq., Civil service, Midnapore,	1858
Prinsep, † Charles Robert, Esq., L. L. D.,	1831
Prinsep, J. H., Esq., Civil service, Sealkote,	1851
Prosono Coomaz Tagore, Baboo, Calcutta,	1833
Prosononath Roy, Rajah, Zemindar, Digaputi, Nattore,	1851

	Admitted.
Puddumlochun Mundul, Baboo, Balasore,	1857
Punchannun Mookerjee, Baboo, Calcutta,	1858
RABAN , Capt. H. (36th N. I.) Calcutta,	1858
Raikes , Charles, Esq., Civil service, Secy. Local Committee, Mynpooree,	1850
Raikes , H. T., Esq., Civil service, Calcutta,	1857
Rait , Henry, Esq., Galimpore, near Surdah,	1856
Rajendralal Mittra , Baboo, Calcutta,	1851
Rajendur Dutt , Baboo, Merchant, Calcutta,	1848
Rajkissen Mookerjee ,* Baboo, Landholder, Ooterparah,	1836
Ramanauth Tagore , Baboo, Calcutta,	1842
Ramanauth Banerjee , Baboo, Ooterpara,	1855
Ramapersaud Roy , Baboo, Calcutta,	1848
Ramchand Sing , Rajah, Calcutta,	1843
Ramgopal Ghose , Baboo, Calcutta,	1840
Ramkissen Doss , Baboo, Calcutta,	1858
Ramnarain Mookerjee , Baboo, Zemindar, Jonaye,	1858
Ram Rutton Roy , Baboo, Zemindar, Burranagore,	1858
Ramsay , Major George, Resident at Nepal,	1855
Ravenshaw , T. E., Esq., C. S., Secy. Public Garden, Monghyr,	1853
Reddie ,† R. M., Esq. Merchant, Calcutta,	1846
Reid , H. M., Esq., Civil service, Burdwan,	1857
Reid , Capt. David, (Executive Officer,) Debrooghur,	1851
Reid , F., Esq., Supt. of Irrigation, Rohilkund,	1858
Richards ,*† J., Esq., Merchant,	1834
Richardson , H. C., Esq., Civil service, Bancoorah,	1856
Ricketts , H. Esq., Member Supreme Council, Calcutta,	1852
Riddell , Col. C. J. B., C. B., Royal Artillery, Benares,	1858
Riddell ,† H. B., Esq., Civil service,	1855
Rigby , Major Henry, (Engineers,) Punjaub,	1852
Ripley , Capt. F. W., (22nd Regt. N. I.) Assist.-Commissioner of Arracan, Kyouk Phyoo,	1849
Ritchie , W., Esq., Advocate-General, Calcutta,	1851
Roberts , J. B., Esq., H. M. Coroner for Calcutta,	1858
Robinson ,† G. B., Esq., Merchant,	1845
Robinson , S. H., Esq., Merchant, Calcutta,	1854
Robinson , T. M., Esq., Merchant, Calcutta,	1848
Rogers ,† Captain T. E.,	1843
Rogers , George, Esq., Solicitor, Calcutta,	1858
Rose ,† Henry, Esq., Civil service,	1847
Rose , W. Grant, Esq., Merchant, Calcutta, (<i>Vice-President</i>),	1837
Ross , Alexander, Esq., Civil service, Furruckabad,	1858
Ross ,† J. G., Esq.,	1852
Ross , R. F., Esq., Merchant, Calcutta,	1855
Ross , Lieut. D. (10th N. I.) Berhammore,	1858

	Admitted.
Row, Lieut. W. S., (33rd N. I.), Rampore Bauleah, ..	1854
Rowlatt, Capt. E. A., Principal Assist.-Commr. of Assam, Kamroop, ..	1855
Ruffeoodgen, Prince Mahomed, Russapuglah, near Tally- gunge, ..	1851
Rummanauth Gossain, Zemindar, Serampore, ..	1857
Russell, A. E., Esq., Civil service, Malda, ..	1847
Russell,† C. D., Esq., Civil service, ..	1839
Russell,† R. H., Esq., Civil service, ..	1855
Ryder, Lt. C. D., (14th N. I.), Sasseram, ..	1858
Sayer,† Col. W., (22nd Regt. N. I.), ..	1845
Sagore Dutt, Baboo, Merchant, Calcutta, ..	1850
Samuells,* Edwards A., Esq., Civil service, Patna, ..	1836
Sandes, Falkner C., Esq., Solicitor, Calcutta, ..	1855
Sandes,† M. F., Esq., ..	1851
Sandys, J. U., Esq., Allahabad, ..	1855
Sapte,† Brand, Esq., Civil service, ..	1851
Sarkies, P. J., Esq., Merchant, Calcutta, ..	1838
Sarkies, S. J., Esq., Serampore, ..	1854
Saubolle, C. A., Esq., Nopara, Kishnaghur, ..	1857
Saunders,† John O'Brien, Esq., Merchant, ..	1856
Savi,† John Robert, Esq., Indigo planter, ..	1836
Savi, Thomas, Esq., Indigo planter, Kishnaghur, ..	1851
Schiller, F., Esq., Merchant, Calcutta, ..	1854
Sconce, Archibald, Esq., Civil service, Calcutta, ..	1839
Scott, Dr. D., Medical service, Delhi, ..	1852
Scott, Lieut. J. F. O., Adjut. Sylhet Light Infy., Cherra, ..	1858
Secretary, for the time being, Artillery, Head Quarter Mess.,	1858
Secretary, Lucknow Botanical Garden, Lucknow, ..	1858
Seymour, S. F., Esq., Admr. General's Office, Calcutta, ..	1853
Sham Churn Mullick, Baboo, Calcutta, ..	1857
Shamachurn Law, Baboo, Merchant, Calcutta, ..	1853
Shamchand Mittra, Baboo, Merchant, ..	1854
Sharpe, the Reverend James, Chaplain, Mussooree, ..	1843
Shawe, M., Esq., Civil service, Sylhet, ..	1842
Shearin, E., Esq., Merchant, Calcutta, ..	1856
Shib Chunder Deb, Baboo, Deputy-Collector, Calcutta, ..	1847
Shib Kissen Banerjee, Baboo, Merchant, Calcutta, ..	1850
Shillingford, Jos., Esq., Indigo planter, Purueah, ..	1853
Sieveking, F. H., Esq., Engineer, E. I. Railway, Bhaugul- pore, ..	1857
Simson, James, Esq., Civil service, Azimghur, ..	1856
Simson, D., Esq., Civil service, Hosheyarpore, ..	1854
Simpson,† H., Esq., Indigo planter, ..	1854
Sinclair,† Lieut. J. J. DeC., Artillery, ..	1851
Skinner, A., Esq., Hansi, ..	1854

Walters,*† Henry, Esq.,	1836
Ward, J. D., Esq., Civil service, Jamalpore,	1857
Ward, J. J., Esq., Civil service, Cuttack,	1852
Warner, J. E., Esq., Indigo planter, Baraset,	1856
Warwick, B., Esq., Merchant, Calcutta,	1849
Waterfield, E., Esq., Civil service, Balasore,	1846
Watson, Hartley, Esq., C. E., E. I. Railway, Monghyr,	1858
Watson, John, Esq., Merchant, Calcutta,	1852
Watson,*† Robert, Esq.,	1837
Watson,† T. J., Esq., Merchant,	1854
Wauchope, S., Esq., Civil service, Calcutta,	1848
Weld, Lieut. Geo., Fort Adjutant, Chunar,	1856
Weskins, Charles, Esq., Merchant, Calcutta,	1854
West, C. H., Esq., Merchant, Lahore,	1850
Western,† Major J. R., (Engineers),	1842
Whampoa, Mr., Merchant, Singapore,	1850
Wienholt,† W., Esq., Merchant,	1848
Wight,*† Robert, Esq., M. D., Madras Medical service,	1836
Wigram, R. J., Esq., Civil service, Burdwan,	1856
Williams, Fleetwood, Esq., Civil service, Meerut,	1840
Williamson, Lieut. James, Commandant 18th Regt. Punjab N. I., Peshawur,	1849
Williamson, Geo., Esq., Cumamara Tea Factory, Jorehaut, Assam,	1858
Willis, Joseph, Esq., Merchant, Calcutta,	1827
Willock,† H. D., Esq., Civil service,	1855
Willocks, W., Esq., Deputy-Supt. Eastern Jumna Canals, Barasuth, near Delhi,	1857
Wilson, A. G., Esq., Deputy-Magistrate, Gyah,	1847
Wilson, I., Esq., Barrister, Calcutta,	1858
Wilson, Thomas, Esq., Deputy Opium Agent, Ghazeeopore,	1848
Wilsone, C. M., Esq., Indigo planter, Munglepore,	1853
Wingrove,† E., Esq., Merchant,	1846
Wingrove,† G. W., Esq., Merchant,	1856
Wingfield, C. J., Esq., Civil service, Lucknow,	1855
Withcombe,† J. R., Esq., Medical service,	1851
Wright, H., Esq., Shahpore, Punjab,	1854
Wood, C. B., Esq., Merchant, Calcutta,	1856
Wood,† Dr. Andrew, Medical service,	1852
Wood, J. N. T., Esq., Merchant, Calcutta,	1854
Wood, R. A. Esq., Indigo Planter, Khabulpore, Kishnaghur,	1858
Wray, G. O., Esq., Solicitor, Calcutta,	1857
Wagentrieber, W., Esq., Tea planter, Debrooghur,	1857
Wylie, Macleod, Esq., Judge Small Cause Court, Calcutta,	1844
Young, James H., Esq., Civil service, Calcutta,	1857

Agricultural and Horticultural Society of India.

LIST OF PREMIA FOR 1859.

PREMIA FOR CERTAIN ARTICLES OF RAW PRODUCE, &c.

FIBRE (SUBSTITUTE FOR FLAX).

production of any new vegetable fibre, which can be successfully applied to all the purposes for which flax is now used, and of which not less than 10 maunds to become the property of the Society.—Rs. 1,000, and Gold Medal

FIBRE (SUBSTITUTE FOR HEMP).

For the production of a quantity of any vegetable fibre, which can be successfully applied to the purposes for which hemp is now used, and equally strong and durable, and of which not less than 10 maunds to become the property of the Society.—Rs. 500, and Gold Medal.

FIBRE (RHEEA).

For the production of at least 25 maunds of Rhee fibre, the whole to be the produce of the party tendering it, and of which 5 maunds to become the property of the Society, to be accompanied by a detailed statement of the process followed in its cultivation and after preparation, and the cost of the same. The quality to be approved by the Society, and the fibre to be in a fit condition for the English market.—Rs. 1,000, and Gold Medal.

N. B.—In the event of there being more than one competitor, the premium to be adjudged to the best specimen.

COTTON (EXOTIC) LONG STAPLE VARIETY.

For the production of at least 10 maunds of good merchantable cotton, raised from foreign seed of the black-seeded long staple kind.—Rs. 1000, and Gold Medal

COTTON (INDIGENOUS).

For the production of at least 5 maunds of Cotton raised from indigenous seed, of a quality superior to that now exported, and such as is likely to prove a substitute for the Upland Georgia or New Orleans cotton of the United States of America.—Rs. 500, and Gold Medal.

N. B.—The producer or producers of the above cotton must submit to the Society a statement of the mode of cultivation and cost of the same.

SUBSTITUTE FOR GUTTA PERCHA.

For the discovery and production to the Society of any new substance the produce of India, which can be successfully used as a substitute for Gutta Percha.—Rs. 500, and Gold Medal.

MATERIALS FOR PAPER-MAKING.

To the producer of at least 6 maunds of fibre suitable for manufacturing into fine paper, such as will prove an efficient and economical substitute for rags or other materials at present employed in India for that purpose.—Rs. 500, and Gold Medal.

QUININE-YIELDING PLANTS.

To the introducer of twenty healthy plants of South American Cinchonas of the kind or kinds known to yield the best description of bark.—The Gold Medal.

MADDER.

For the production of at least 5 maunds of Madder, raised in any part of India, of which one maund to be the property of the Society.—Rs. 500, and Gold Medal.

N. B.—This prize to be renewed for three years, in the event of a specimen or specimens not being sent in by 31st December, 1858.

SUBSTITUTE FOR GUNNY CLOTH.

For the production of a cheap and efficient substitute for gunny cloth, suitable for packing sugar or grain, of which a piece of 36 yards in length, by 2 feet 3 inches in breadth, or thereabout, to be submitted to the Society.—Rs. 500, and Gold Medal.

PREMIA FOR ESSAYS ON CERTAIN SUBJECTS.

For an approved Essay on the following subjects :—

1. For the best practical Essay on the production and relative cost of the various oil seeds of India, suitable for export.—A premium of Rs. 500.

2. For the best practical Essay on the present mode of cultivating and manufacturing Indian fibre-yielding plants known in commerce, such as jute, sunn, &c., with practical suggestions for their improvement.—A premium of Rs. 500.

3. For the best practical Essay on the present mode of cultivating and preparing the various tanning products of India, with practical suggestions for their improvement.—A premium of Rs. 500.

1. The Essays must be of a practical character, containing the results of the Writer's own observations or experiments, and not merely a compilation from books.

2. Drawings, constructed to a stated scale, shall accompany writings requiring them.

3. All competitors to enclose their names in a sealed cover, superscribed only with their mottos, and the subject of the Essay.

4. The President or Chairman of the Council shall open the cover on which the motto designating the Essay, to which the premium has been awarded is written, and shall declare the name of the author.

5. The Chairman of the Prize Essay Committee shall alone be empowered to open the motto paper of every essay not obtaining a premium, that he may think likely to be useful for the Society's objects, with the view of consulting the writer confidentially, as to his willingness to place such Essay at the disposal of the Committee of Papers for publication.

6. The copyright of all Essays for which a premium has been awarded, shall become the property of the Society, for publication in their *Journal*, or otherwise.

7. The Society are not bound to award a prize, unless they consider one of the Essays deserving of it, but may award such part of the premium as the Essay may be adjudged to deserve.

8. In all reports of experiments, the expenses shall be as accurately detailed as practicable.

9. The Calcutta bazar maund of eighty sicca weight ~~and the~~ and the Company's Rupee, are the only weight and currency in which calculations are to be made.

10 No prize shall be given for any Essay that has already appeared in print.

11. All Essays to be addressed to the Secretary of the Society, METCALFE HALL.

PRIZE FOR A GARDENER'S VADE-MECUM.

To any person who shall produce on or before the 31st December, 1859, the best practical treatise on gardening, as applicable to Lower Bengal, or a Gardener's Vade-Mecum, the sum of Rs. 600.

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2nd. The Treatise to become the property of the Society for publication in its Journal, or otherwise as may be deemed fit: and one hundred copies to be placed at the disposal of the Author, free of charge.

A. H. BLECHYNDEN,

Secy. A. and H. Society.

METCALFE HALL,

Colombo, June 1850.

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THE JOURNAL

OF THE

Agricultural & Horticultural Society

OF

INDIA.

THE INDIGENOUS PLANTS OF BENGAL.

Notes on peculiarities in their structure, functions, use in medicine, domestic life, arts and agriculture: By the REV. J. LONG.

(Continued from page 424 of PART III, VOL. IX.)

29. TEREBINTHACEÆ.—Turpentine tribe. Varnishers.

Am (Mangifera Indica).—Mango. Belongs to an order which yields the varnish, hence resinous matter abounds so much in some mangoes that they taste like tar and turpentine. The mango tree is held sacred by the Hindus, and is worshipped on Thursday, because Lakshmi, the patroness of wealth, loves its shade. Its Sanskrit name is *chûta*, i. e., the juicy—*madhudut*, or the messenger of spring, when it blossoms—*madhycaganda*, moderate scent. The hardness of the stone is caused by the thickening of the membranous sides of cells by a hard sedimentary matter called sclerogen; the stones must be sown soon after they are taken from the fruit. The yellow flowers have one fertile stamen. Fl. C.S. Fr. H.S. Some old trees are fifteen feet in circumference. The lower branches spread horizontally to a great extent, the upper ones gradually ascend

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till they become nearly erect in the centre. Leaf-stalks thickish at the base. Petals five, as also sepals; anthers oval, purple. A gum from the bark, which age renders very hard, burns with a cracking noise, and is of a pungent taste. The fruit of its seedling is so liable to change, that if not propagated by grafting, the seedling of a sweet mango will bear sour fruits. Forty varieties in Java. Introduced into England 1690. Boils caused by eating too many, hence its Sanskrit name *amrā*, sickness.

Amrá (Spondias Mangifera).—Hog-plum. Grows to a large tree in the Coromandel mountains. Fl. H. S. Leaves feather-shaped, with an odd one, have a very peculiar smell when bruised. Leaflets five pair. A gum from the bark in the hot season; it seems very like gum-arabic. Fruit eaten raw when ripe; before being ripe it is used in curries. Sanskrit name *madhuramlak*, sweet and sour.

30. CUCURBITACEÆ.—*Gourds*; annuals. Climb by claspers attached to the stalks; hairy, drastic, pulpy and refreshing; seeds yield oil, and are scattered in a fleshy substance.

Rákhla Sasá (Karivia umbellata).—Stem five-sided; roots and fruit eaten by the natives.

Turmuḡ (Cucurbita citrullus).—*Water-melon.* Contains a red, pale juice, used much by natives in the hot season. The stem is furrowed, hairy, with lateral two-notched tendrils; its leaves are much divided. The fruit is 1½ foot long, extensively cultivated in the Indian Archipelago. To the Egyptians it is both food and physic. In Senegal, the fruit sometimes weighs 60 lbs.

Mákhál (Trichosanthes palmata).—The fruit is a greenish, striped gourd; on being ripe it becomes yellow; pounded and blended with warm cocoa-nut oil, it is used for diseases in the ears. The pulp is a powerful purgative, yet at the Cape of Good Hope the gourd is rendered so mild by being pickled, that it is eaten; in the West Indies it is used for killing rats, and in Bengal, by boys in games. The

plant is common on the sandy lands of the Coromandel coast; in Northern Africa stuffings for mattresses are made of it by Europeans.

Uchheá (Momordica muricata).—Indian cucumber. Much used in curries. Sanskrit name *susavi*. Fruit covered with small sharp points, with tubercles between: found in every market. The *karolla* also belongs to this genus, but the fruit requires to be steeped in salt water before it is used, as it is bitter. The *golkánkrá (Momordica mixta)* has a red fruit and yellow pulp; the tuberous roots are eaten.

Jjinga (Luffa fatida).—Leaves five-angled; fruit ten-angled; much used in curries served up with butter, pepper and salt. Another species, the *karula* or *luffa amra*, is violently cathartic, and emetic, and its ripe seeds are used for that purpose; the natives apply the juice of the young fruit to their temples to cure head-ache. The *dhundul*, or *Luffa pentandra*, has the lower leaves five-angled, the higher ones palmate; seeds black, irregularly pitted.

Kumará (Cucurbita Pepo).—Leaves very downy; fruit when young very hairy, when ripe the hair is gone, and it becomes covered with a white powder; the seeds are white; tendrils three cleft.

Kadu (Lagenaria vulgaris).—Pumpkin. Bottles are made from this; it is naturally very drastic, some sailors were once poisoned from drinking beer out of a flask made from the rind of this gourd; but cultivation, as in the potato, removes these bad properties: from one variety of this is made the stringed instrument *silár*, and a buoy for swimming across rivers, hence its Sanskrit name *alaru*, i.e., what does not sink. The stamens are curiously lobed and twisted; leaves tomentose, i.e., densely hairy; scent musky. In good soil it sends out shoots 40 or 50 feet long. On the continent of Europe it is used to feed cattle, its seeds yield an oil.

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Chichingá (Trichosanthes anguina).—Snake Gourd. Fruit used universally; tapering shape. There is a wild species, the *banchichinga*, but not eaten.

Patol (Trichosanthes dioica).—Leaf-stalks woolly, channelled, tube of the corolla trumpet-shaped. Though universally cultivated in Bengal, it was unknown on the Coromandel coast in Roxburgh's time. Sanskrit name *Karkásh chhada*, hard leaf. An useful purgative.

Bhui Kumrá (Trichosanthes cordata).—Grows wild at the mouth of the Megna. The root, which grows to the size of a man's head, is eaten.

Khurbuj (Cucumis melo).—Melon. Originally from Persia. It is a creeper with palmate leaves; grows naturally in every desolate place. When the proportion of heat to light is considerable, a greater number of staminiferous flowers are developed, if otherwise, of pistilliferous. Melons are better in the N. W. P. than in Bengal; those of the melon tribe in Agra, which are cultivated on the sandy flats left by the subsiding waters of the Jumna, are famous.

Sasá (Cucumis sativa).—Cucumber. The seeds used in cholera.

Phunti (Cucumis momordica).—The fruit is from four to eight pounds weight; very like the common cucumber, but larger: when ripe it tastes like a melon, and bursts slowly in various portions. The fruit of the *khirá*, another species, contains sugar, and yields a mild oil.

Kéankur (Cucumis utilissimus).—The fruit is yellow, the size of an ostrich's egg; will keep for months if not bruised. The seeds are ground into meal; oil expressed from them is very nourishing; the powder of the toasted seeds is a powerful diuretic, much cultivated in the Guntoor Circars, where they form a considerable article of commerce.

Saphari Kumrá (Cucurbita maxima).—Squash gourd. The fruit tastes much like a carrot. Torose, *i. e.*, elevated and depressed: leaves angular-toothed, hairy. It grows very

rapidly, sending out shoots forty feet long, which will cover nearly half a biggah in a season. On the continent of Europe it is extensively cultivated for the feeding of cattle and hogs, while the seed yields an oil, suitable both for food and burning. In England it is eaten baked.

Telá Kuchá (Coccinia grandis).—A native of every hedge. Stems five-sided; leaves five-angled, with a few minute teeth round the margin; berry before ripe marked with streaks of white. Crows are fond of the fruit. The fruit is eaten raw. Its Sanskrit names are *bimba*, disk of the sun, which its red fruit is like—*raktaphalá*, red-fruited: it is used much as a simile in Hindu poetry, to denote pretty lips.

31. PAPAYACEÆ.

Pepiaya (Carica Papaya).—A native of the banks of the Mississippi, introduced by the Portuguese into India three centuries ago. On the West coast of Africa the sickening smell emitted by the flowers is considered the cause of much sickness. Each male flower has a rudimentary ovary, capable of becoming fertile. It seldom has branches; the stem is milk-yielding, succulent, cylindrical, hollow, and often, eighteen months after the seed is sown, it bears fruit. The leaves are lobed, sinuous shaped like the hand with the fingers expanded; the leaf-stalk is hollow. The ripe seeds when chewed have the flavour of Indian cress. The acrid milky juice of the unripe fruit is used generally in the Mauritius and Malay countries as a cure against worms in young children. The flesh of old fowl which feed on its leaves or fruit become tender. In Barbadoes the flesh of animals hung to its branches becomes soft.* The Javanese regard the seeds as valuable against worms, and use them very much. The female tree will not yield ripe fruit if the

* Dr. John Davy however observes that the trials he made afforded "negative results, tending to prove that the effect on the meat was owing to other and incidental circumstances, rather than to any special power possessed by the plant."—(*Edin. New Phil. Journal*, Oct. 1855.)

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male is not near it, though at Malacca it is common for the male tree to give fruit. In the West Indies, the fruit is eaten with pepper and sugar; in the French West Indies, the negroes use the leaves to wash their clothes, instead of soap. In Barbadoes, the juice of the fruit is given to horses to reduce buffy blood. There are buds which give lateral branches if the top fail, showing how the tree can adapt itself to circumstances. It has a five-toothed calyx, corolla five-lobed: stamens ten, anthers turned inwards, stigmas five-lobed, placentas five, testa pitted, placentas spread over the whole surface of the carpels. The frost in the northern part of India is sometimes so severe as to destroy in a single night large *pepiayas*, its texture being loose. From its resemblance to the castor-oil plant, it is called *arankhurbug*. The fruit is eaten both raw, boiled, pickled, and preserved. The tree is ornamental like the palm, the size and beauty of the leaf much admired by strangers.

32. PASSIFLORÆ.—Usually climbers. South America their head-quarters, where one of them, the *Passiflora cœrulea* grows thirty or forty feet high in a single season, and has a stem as thick as a man's arm.

Jumká (*Passiflora citriflora*).—Flowers very fragrant. *Passiflora edulis* and *quadrangularis* succeed well in various parts of Bengal, and appear to be naturalized in Ceylon.

33. MORINGACÆ.—Horse-radish tribe.

Shajiná (*Moringa pterygosperma*).—Horse-radish tree. The legume is an excellent pot vegetable; the leaves and flowers are eaten in curries; flowers used as a pickle in oil. The green root has the appearance, taste and qualities of the radish. It is pungent; used as a stimulant in paralysis, and an oil from the seeds is applied in rheumatism and in dropsy. The leaves are irregularly tripinnate, *i. e.*, twice or thrice pinnate, with an odd leaflet; the leaflets stand on slender purplish leaf-stalks, waving beautifully in the wind. The flowers white, tinged with yellow at the base. The

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Javanese prize this tree very much for its legume, root, and seeds; in Jamaica the wood is used for dyeing a blue colour; the Koles in Orissa hold this tree in high veneration. Half the stamens sterile. A red-flowered species, *madhushigru*, found near Malda. India and Arabia the native countries, but now introduced into the West Indies, where a very pure sweet oil is extracted from their seeds, known in commerce as the oil of Ben; it is used by watch-makers, as it does not quickly freeze. A little of the juice added to mustard, makes it almost too pungent to taste. A gum made from its wounded bark. Its Sanskrit name *shigrumul*, sharp root—*gandha* scent, *i. e.*, its flower smells like honey—*shobánjan*, beautiful anointment, *i. e.*, its oil is good for the gout.

34. PORTULACÆ.—*Juicy plants*; insipid; no smell, dull green; half belong to the Cape of Good Hope.

Barabuniyá (Portulaca oleracea).—All over India, Ceylon, and Java. Leaves wedge-shaped, fleshy; flowers open at noon, and shut at two. In Cochin-China the seed considered emollient.

35. CRASSULACÆ.—Fleshy stems and leaves. Out of three hundred species in this order not more than two are found in the plains of India. Like cacti, resisters of heat, live on air; fleshy succulent leaves. Soil more of use for keeping them stationary than for nourishment.

Himságur (Kalanchoe laciniata).—An African plant. It has a wonderful power of resisting heat. One of this order, *Briophyllum calycinum*, was introduced into Bengal in 1799 by Lady Clive; it is now spread over the country. Its leaves are said to be acid in the morning, tasteless at noon, and bitter in the evening, this is owing to the light causing the oxygen to exhale from the plant. If the growing leaf is suspended in the air, it will keep green for several weeks, and in the mean time yield from its glandular serratures a crop of young plants. *Echeveria* has the

same property, so certain *Arums*, and *Gesneria*. It grows on dry spots, where even moss cannot grow, and draws moisture from the air. The succulent leaves are used by Mahommedans to clean ulcers and allay inflammation.

36. *CACTACEÆ*.—*Indian figs*. All natives of America. Leafless stems, some of which are flat as *Opuntia*, triangular as *Cereus*, cord-like as *Rhipsalis*, or melon-shaped as *Melo-cactus*. In Linnæus' time only 12 species of *Cactus* were known, now there are 400. Has a beautiful but short-lived flower; no distinction between calyx and corolla. One species supplies the red hue which tinges the Cochineal insect red. 70,000 form one pound of lac, 400,000 lbs. weight of which are sent from Mexico to England.

Phani manasá (*Cactus Indica*).—This is probably not indigenous to India, but, like the rest, South American. Joints proliferous; the little caduceous bodies over the joints are leaves, which are sub-conical. Thorns very strong; their insertions are surrounded with numerous sharp bristles, flowers from the upper edges of the joints, of a beautiful yellow, opening only in the day. Its chief nourishment is from the air, hence it flourishes in the hot deserts of South America, the thick skin and few pores, enabling it to retain a store of moisture, as the camel holds water in its stomach. On Mount Etna and its volcanic fields it is this *Phani manasá* which the Sicilians employ to render those desolate regions susceptible of cultivation, as its roots readily strike into the fissures of the lava, bursting the largest blocks asunder, and by their gradual increase making the soil capable of being worked. It yields a large cooling fruit sold there in considerable quantity. The donkeys in South America extract the juice when thirsty, stripping off the dangerous spines with their hoofs. It is used as a hedge plant in the Deccan, but it excludes air, and harbours venomous animals. Cultivators have an

The indigenous plants of Bengal!

objection to it, as it spreads so wide, and impoverishes land. The stems are used in cases of tooth-ache and for corns.

37. UMBELLIFERÆ.—*Flowers umbrella-shaped.* Leaves much divided, sheathing, hollow; furrowed and hollow stem; seeds have aromatic oil; narcotic, acrid, but rendered, like the potato, mild by cultivation. 900 species.

Thalkuri (Hydrocotyle Asiatica).—*Native parsley.* Creeping in shady places.

Joán (Ptycholes ajowan).—Seeds taste like carraway, used in flatulent colic, and cooking. Anthers redish. Sanskrit name *Bráhma-darbá*, Brahma's sacrificial grass. There is also the *ban joán*, the seeds of which are used as a medicine for cattle.

Rándhani (Pimpinella involucrata).—Seeds used in medicine, in disease and diet; three ribbed on the back.

Pántorási (Enanthe stolonefera).—Roots jointed.

Pánmahuri (Feniculum panmori).—Seeds eaten in curries; an annual of four or five months duration. Sanskrit name *madhuricá*, i. e., sweet-tasted seeds.

Shulphá (Anethum sowa).—Seed used for curries, flatulence and colic. Sanskrit name *mishreya*.

Dhanyéú (Coriandrum sativum).—Fruit carminative; when unripe has the smell of bugs.

Gájár (Daucus carota).—*Carrot.* Introduced from Persia.

38. LORANTHACEÆ.—*Parasites with a stringent bark.*

Chhota mandá (Loranthus globosus).—Leaves three-fold; when ripe the pulp of the fruit is yellow, clammy and elastic, which makes it adhere to the branches of trees, where it germinates; petals-shaped like a thong.

Bara mandá (Loranthus longiflorus).—Common on mango trees.

39. RUBIACEÆ (or *Coffee tribe*).—Febrifuges; emetic; two stipules at the base of the leaf; 330 Indian flowering plants compose this order, to which quinine belongs.

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Kadam (*Nauclea cadamba*).—Noted for its pleasant shade, erect trunk, horizontal leaves, and beautiful orange coloured flowers; the large white clubbed stigmas project from the corolla, forming a large orange head: used as a medicine. Its capsules shaped like a ship (*nauclea*.) The holiest of Indian trees, fruit size of a small orange, eaten by the natives; stipules are triangular, buds angular. Its Sanskrit names are *halipriya*, Vishnu's favourite—*jirnaparna*, old leaves, *i. e.*, rough—*karnapurak*, *i. e.*, leaves resembling the ear-drops of a Hindustani earring. Fruit used in a game. There is also the *kali kadam*, with beautiful wood.

Gandha ráj (*Gardenia florida*).—A native of China. The seeds nestle in a firm deep orange coloured pulp used for dyeing. The flowers pure white, are generally double; the petals of a fleshy substance, which gives the corolla a peculiar wax-like appearance. Berries turbinate, *i. e.*, the figure of a top, with as many sharp ridges as there are divisions in the calyx. Another of this family, *G. lucida*, yields a resin which exudes in transparent drops, or tears, from the extremities of the young shoots, and especially from the flower buds. This resin is chiefly useful for its medicinal properties, which resemble those of myrrh; it is employed by the natives as an anti-spasmodic to children attacked with convulsions during dentition.

Khet páprá (*Hedyotis Burmanniana*).—Leaves of one species are ear-shaped: another species yields the Indian ~~mint~~.

Ach (*Morinda tinctoria*).—The bark of the roots is used to dye red, the green fruits are eaten with curries; wood hard and durable, variegated with red and white, and is preferred to any other for gun-stocks; there is also the *ban ach*.

Mayná (*Vangueria spinosa*).—Armed with three-fold thorns, leaves and stipules three-fold. Fruit and berry edible.

Ranjan (Ixora bandhuca).—Jungle geranium. Flowers the whole year; when they first open, they are scarlet, then they change to crimson. There is no stem, but there are many branches, which spread close to the ground in a hemispherical form. Its botanic name *Ixora* is the name of a Malabarian idol, to which were offered the flowers of some of the species. Its Sanskrit names are *raktaka*, i. e., red-blossomed—*bandhujib*, a friend of life. One species of this is called “the flame of the woods.”

Jui (Pavetta tomentosa).—Branches cross-armed, ascending. The *kukurchura*, belonging to this genus, has leaves smooth on both sides: the *páluk jui*.

Káoyá ban (Coffea Bengalensis).—A native of Sylhet.

40. COMPOSITAE.—Flowers in clusters, so as to form one which is apparently single, generally yellow, with united petals; anthers adhere in a tube. Oil in some. Tonics. One tenth of the plants in the world belong to this order, which comprises 1000 species; they have hairs which brush the pollen out of the anthers, and thus contribute to fecundity. Many bitter and aromatic, some poisonous, others nutritive.

Koksim (Vernonia cinerea).—Every soil and situation suits it, it is in flower the whole year; stem finely furrowed; seed hairy; leaves lyre-shaped: the *bara-koksim* has a smell of turpentine.

Somráj (Vernonia anthelmintica).—Pappus of hairy bristles. Fl. CS. Stem clouded with elevated purple spots, tube curved, seeds hairy. All parts of this plant bitter; the powdered seeds are used as a worm medicine.

Ban okrá (Xanthium orientale).—Fl. CS. Two to three feet high. Found near rubbish and rivulets. Sanskrit name *arishta*.

Surjeamukti (Helianthus annuus).—Sun-flower. Originally from Peru, where the Peruvians considered its flowers as emblems of the sun, they made golden images of the flower, and with them decorated their priests at the temples. The

Spaniards' were surprised at the riches shown on these occasions; when they afterwards saw the plants glistening in the fields, they thought they were of gold. The sun-flower is said to turn its flowers in the direction of the sun, hence it has been called the Sultan of flowers—Moore writes—

The heart that has fondly loved never forgets
But truly loves on to the close,
As the sun-flower turns to her god when he sets
The same look which she turned when he rose.

Oil is extracted from the seeds, which also afford nutritious food for poultry and cakes for the North American Indians; leaves 3 nerved.

Hingchá (Enhydra heloncha).—Extending itself considerably over the surface of the adjoining pools of water.

Gendá (Tagetes erecta).—*African marygold.* Originally from Mexico like tobacco, though now considered as indigenous in Persia, China, and India. It is a great favourite with Indian gardeners, and also with the Chinese; and in Germany it is called the golden flower. The African marygold denotes rain if its corolla shuts after eight in the morning; the barley also forewarns of it by lengthening its awns. In Holland, when the monarchical party sided with the Prince of Orange, the republican party, in their hostility, rooted up all the oranges and marygolds in the gardens, and even prohibited the sale of oranges and carrots in the markets, on account of their colour. The true marygold, called *Calendula*, was thought to flower in the Calends of every month. In warm summer evenings flashes of phosphoric light have been seen to play round the petals. It opens its flowers *with the sun*. The modest yet glowing marygold was named so in honor of the Virgin Mary, hence also the name of the flower called our Lady's slipper. There are two species; the French marygold, *chhota-genda*, and the African, *bara-genda*.

Chandru mul (*Pyrethrum Indicum*).—A native of China; root biennial, has no stem; roots fragrant but bitter; used as a medicine and perfume; seeds with a margin round the apex; flowers impress a peculiar pricking sensation on the tongue when chewed.

Háñchuti (*Miringyne minuta*).—Seeds used by natives for snuff.

Nág dáná (*Artemisia vulgaris*).—Indian worm-wood; named after the goddess Diana (Artemis); stalks channelled; leaves whitish below, green above, when rubbed have an agreeable smell. Employed by the ancient Greeks, and by the Chinese in medicine. Common in England. The *dáná* has bitterish leaves.

Kusum (*Carthamus tinctorius*).—Safflower; flowers used by dyers, the seeds for oil, and also in rheumatism.

3RD. SUB-DIVISION. COROLLIFLORÆ.

The stamens adhere to the corolla, which has all its petals united.

41. SAPOTACEÆ.—Milky; flowers hermaphroditè. 200 species. Gutta-percha belongs to this order.

Bakul (*Mimusops elengi*).—Named *Mimusops elengi* from a fancied resemblance of its flowers to an ape's face. Leaves a deep shining green; noted for its drooping very fragrant flowers; it grows wild only in the Rajmundry Sircar. Branches very numerous, with the extremities ascending, so as to form a most elegant globular thick head. The bark is astringent, used in medicine; two rows of sepals two wheels of lobes to the corolla. Fruit sweet and astringent; which improve the colour of the skin. Musalmans plant this tree round their mausoleums.

Muawia (*Bassia latifolia*).—Flowers distilled yield an intoxicating spirit drank very much in Behar; seeds produce an oil used in making native soap.

42. EBENACEÆ.—Ebony tribe. Bark febrifuge. Black hard wood in some.

Ban gáb (*Diospyros cordifolia*).—Berry eight-seeded. Fl. HS. Another species, the *gáb*, (or *Diospyros tomentosa*) is a large tree; the astringent viscid mucus of the fruit is used for paying the bottom of boats. Fishing nets are steeped in an infusion of the fruit, to make them more durable.

43. JASMINEÆ.—*Night scenters*. Fragrant oil from the flowers; corolla salver-shaped, five or more cleft, yet only two stamens; petals fold over each other like tiles of a house. Have a tendency to ramble or climb.

Ban-mallika (*Jasminum sambac*).—*Arabian jasmine*. Very common in every jungle, owing to birds eating the berry, and dropping the seeds, which vegetate; the berries are a beautiful shining black. In the axils of the veins on the back of the leaves are tufts of down, as in certain *Gardenias*. The flowers offer a rich cup to the gay butterfly. In Tuscany, the damsels on their wedding-day deck themselves with a nosegay of jasmine, in memory of a girl betrothed to the Duke of Tuscany's gardener, who made a fortune by the sale of this jasmine, then known only to the Duke, who forbade any to be given away; but the gardener gave in a nosegay a sprig to his betrothed on her birth-day; to keep it fresh, she put it in the earth; shoots came up, a demand arose for it, she made a fortune, which she presented to her lover on her marriage-day. Hence the ladies in Tuscany have a proverb, "she who is worthy to wear jasmine flowers is a fortune to her husband"—

Brides, as delicate, as fair.

As the white jasmine flowers they wear.

Kunda (*Jasminum hirsutum*).—Anthers beaked; stigma clubbed.

Jui (*Jasminum auriculatum*).—Branches cross-armed, ascending flowers open in succession; lower leaves in threes. Sanskrit names *majadhi*, produced in South Behar—*ganiká*, country—*yuthicá*, a mixture.

Jati (*Jasminum grandiflorum*).—Flowers white, externally suffused with purple ; commonly used to make *durbar* or wedding garlands. Climbing. Three or five leaflets, confluent, *i. e.*, running into one another. Sanskrit names *suman*, handsome—*málali*, presented to Vishnu. The corolla has purplish edges.

Singáhar (*Nycthanthes arbor tristis*).—Called the sorrowful tree, because its flowers, scentless by day, open at sunset, and at sunrise lie dead and scentless. Used by Indian ladies for garlands. In Bengal it flowers chiefly in the rainy season, but in Madras nearly all the year. The flower, is very fragrant, smelling like that of fresh honey. The orange tubes give a most beautiful dye, but it is not permanent. It is grown only from seed, hence there are few varieties. It was introduced into Pisa from Spain, and, to secure it, a sentinel was placed there by the Governor to guard it. Its Sanskrit name is *nishipushpa*, the flower of the night—

Plants which sleep while others wake,
Like timid jasmin buds that keep
Their odour to themselves all day,
But, when the sun-light dies away,
Let the delicious fragrance out
To every breeze which rounds about.

Branches square ; leaves fall off in the hot season ; used for polishing wood.

The *bela* and *bara-bel* also belong to this genus.

44. MYRSINÆ—Abound in insular localities.

Ban jám (*Ardisia humilis*).—One or more trunks from the same roots. Leaves glossy, wedge-shaped ; juice of the berries bright red, but on paper it changes to a durable brown.

45. APOCYNACEÆ.—*Dog-banes*. Some are milky shrubs, poisonous, though with beautiful flowers ; some are fibre-yielding. The embryo inverted. Corolla twisted before opening. Stigmas collected into a massive head, expanded at the base in the form of a ring, contracted in the middle. The Cow tree of Guiana belongs to this order.

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Shyemā latā (Ichnocarpus frutescens).—A twiner like the *malati*. Stalks and leaves used in the form of a decoction in fever. Roots currently employed in hospitals under the name of country sarsaparilla.

Hāpaṛ māli (Vallaris dichotomas).—A twiner. Juice used in wounds by natives.

Gulachin (Plumiera acuminata).—Every part is full of a tenacious white juice, which exudes plentifully on being wounded. Trunk crooked, eight feet high. Branches three-forked, swelled towards the ends. Leaves wedge-shaped, lanceolar, acute. Many straight veins run towards the circumference, and are lost in another waved vein, which surrounds the leaf within the margins; some one foot long. Leaf-stalks long, with a small channel on the upper side. Flowers succeed one another for a great length of time: on the outside tinged red, inside pale yellow: fragrance chiefly at night. Corolla funnel-shaped, divisions obovate. Seeds in thirty-five years once.

Karabi (Nerium odorum).—*Oleander*. Called the laurel rose. It is poisonous, hence its Sanskrit name *ashvagna*, horse-destroying—*payari*, horse's enemy—*shatapras*, one hundred darts. A decoction of its leaves forms a wash used in the South of Europe to destroy vermin on the skin, in Bengal for a blood-shot eye: its powdered wood and bark served at Nice as the basis of an useful rat poison. Seven French soldiers were in 1809 poisoned near Madrid by eating meat roasted on sticks of *oleander* used as spits. Prussic acid is obtained from it. The root is often taken by Hindu women to destroy themselves when tormented by jealousy. The bark of the root, and the sweet smelling leaves, are applied to sores. In the South of France they cure the itch by a wash made from its leaves and bark. Leaves contain tannic acid; they have no pores, but, in lieu, cavities filled up or protected by hairs. The pith is triangular in shape. There are four varieties—the *rakta*, with red flowers, the *swet* with white, the *lāl*

padma with double, and the *sweet padma* which flowers the whole year.

Chhátin (*Alstonia scholaris*).—Bark powerfully tonic, used by villagers in bowel complaints. Its juice valued for spleen and tooth-ache. Wood as bitter as Gentian.

Tagar (*Tabernæmontana coronaria*).—Tube yellow; flower white, generally double; fragrant at night; forked two branches. Stipules within the leaves and resinous; pulp yields a very beautiful colour. *Phirki tagar*, the name of the single-flowered one—*bara tagar*, of the double-flowered. One of this genus has such beautiful fruit and flowers that the Ceylonese say it was the forbidden fruit.

Karamchá (*Carissa Carandas*).—Has a gray bark; the branches two-forked, stand at nearly right angles, having sharp thorns in pairs at their division, hence its Sanskrit name *karmurda*, hand-bruise. The flowers are like jasmine; the fruit is used to make pickles, tarts, &c. It forms an almost impassable fence. The berries are a shining black.

China Karur (*Cerbera Thevetia*).—A large shrub, or rather, a small tree, with oleander-looking leaves, and pretty bell-shaped, bright yellow, sweet scented flowers; fruit size of a crab apple: it is easily propagated from cuttings. A native of S. America and the W. Indies; naturalized in Bengal. The seeds yield a good limpid oil, valuable for lubricating fine descriptions of machinery.

46. ASCLEPIADEÆ.—*Acrid milky juice*. The grains of pollen in this order are collected into waxy masses. The medicinal effects of some species originated its name from *Æsculapius*, the Roman God of medicine. Generally twining perennials. The seed-vessels are in pairs, and, on bursting, display a quantity of thistle-like down attached to each seed which floats them.

Anta mul (*Tylophora vomitoria*).—The root, given in a large dose, is an emetic; in a small one, purgative. A substitute for *ipecacuanha*.

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Akhanṭa (*Calotropis gigantea*).—*Madar*. Abounds every where in India. Famous for its root, which, is used in fevers, ringworm, leprosy, and rheumatism; also for making charcoal; it is often substituted for ipecacuanha. Tanners use its juice to take off the hair from skins, and the Rajputs to poison their daughters. The leaves are employed in dropsy, and, being warmed, are applied to any limb swollen with rheumatism; in Bahar, they are burnt for fumigating obstinate sores: the leaves are eaten by only three creatures with impunity—the grasshopper, caterpillar, and goat. A large cricket also feeds on its leaves. Each of the seeds in the large pod has cottony hair instead of a skin, and in Northern Africa a stuffing for mattresses is made from it by Europeans. Ten plants will yield one pound of a juicy substance like gutta-percha. The fibre is used for fishing nets on the Indus, and could yield a silky flax. This plant comes to maturity in a year, and requires neither water nor culture. Its flower has beautiful rosy purple points, and a fine white centre. The stamens have a kind of crown; the pollen is glutinous. The Arabs use the acrid milk to stupify monkeys which they wish to catch. The Nubians use the filament of the fruit as tinder. Sanskrit name *arkaparna*, sun-leaves—*pratāpasha*, heat-destroyer—*ganarup*, many-formed. Grows in the most barren soils, and might be used to reclaim poor soils.

Duda lata or kerui (*Oxystelma esculenta*).—Leaves fall off in cold season. Sanskrit name *dughdiká*, as every part abounds in milk. Flowers furrowed with purple veins. The *shomlatú* of this genus yields a mild juice, used by thirsty travellers.

Chágal Páti (*Cynanchum pauciflorum*).—Juice very gummy; yields a very fine fibre. Its botanic name signifies the dog-strangler, *i. e.* it is poisonous.

Chágal bánti (*Daemia extensa*).—Smell offensive. Furnishes a fine silky fibre. Follicles like a hedge-hog in shape, their native name means “like a goat’s nipples”

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Ananta mul (*Hemidesmus Indicus*).—Roots used by Natives for the thrush. The anthers and stigma are only half attached, hence its name. An emetic, and said to be a good substitute for sarsaparilla.

47. GENTIANÆ.—*Bitter tonics*. Ribbed leaves. Found on snowy mountains, and hot sandy plains. The *chiratá* belongs to this order.

Gimá (*Erythraea centaurioides*).—Stems four-sided.

Páñchuli (*Villarsia Indica*).—*Indian buck bean*. Floats on sweet waterpools, its roots often do not reach the bottom.

48. PEDALIACEÆ.—*Oil seed tribe*. Leaves emollient. Africa their head-quarters.

Til (*Sesamum Indicum*).—Leaves emollient; the upper always narrower. Sown in February, crop got three months after; depends much on the dew for moisture. On the 11th of Magh, when there are ceremonies in honor of Bhima, water and oil of *tila*, offered to the *pitris*, are considered equal to obsequies continued for one hundred years. Sanskrit name *atul*, unequal. The *krishna til* of a large size, and a dark color, is sown in June; it yields the gingely oil of commerce largely employed to adulterate olive oil.

49. CONVULVULACEÆ or *Jalap tribe*.—*Bind-weeds*. Herbs; twining; many with a purgative milky juice, arising mostly from the roots. Corolla plaited. 660 species.

Kalmi latá (*Rivea bona nox*).—Leaves used as a pot herb. Found in abundance in Midnapore. Flowers expand at night, perfuming the air with the scent of cloves.

Bich Tárák (*Argyreia speciosa*).—Its Bengali name means destroyer of poison, *i. e.*, it heals wounds. Climbs to the tops of the highest trees. Veins parallel; under-side of the leaves covered with a silky silver colored down; leaves applied to boils, the upper side used in Madras to disperse boils, the lower to ripen them. The *chhota-bich-tárák*

(*Argyreia argentea*) or elephant-creeper, called also *samudra-shok*, ocean's joy, has pink flowers.

Bhui Kumrà (*Bátatas paniculata*).—Root purgative; flowers dark red purple. Eaten by cattle. Seeds woolly all round; powder of root used in spleen.

Lál Shakar Kunda úlí. (*Batatas edulis*).—Sweet potato. Roots nutritious; this vegetable is cultivated in Scinde, and also by the New Zealanders. The *saphed* has white tubers.

Nil Kalmi, or *Kálá danná* (*Pharbitis Nil*).—Its seeds are an excellent and cheap purgative; they are roasted like coffee, and the powder given. Dr. O'Shaughnessy remarks of it—"In ten-grain doses it produces all the effects of jalap with certainty and speed; the taste is scarcely perceptible. The seeds sell four seers for one Rupee. We have thus a remedy of unparalleled cheapness, perfectly equal to jalap as a cathartic, superior to it in portability and flavor, occurring in all parts of India." Common through India during the rains. Its large blue flowers very beautiful, expand early in the morning, hence called in Virginia "morning glory."

Dudhiya or *Dál Kalmi* (*Calonyction Roxburghii*).—Stem runs the height of ten or twenty feet; flowers, very large and fragrant, open at sunset and close up the following morning. In the Circars it flowers in the cold season; in Bengal in the rains. Bark of the roots employed by Natives as a purgative; the root has been found to contain resin, fatty matter, volatile oil, albumen, starch, fibre, malic acid, and various salts.

Kalmi Shák (*Ipomea reptans*).—Forms a net work of vegetation on the surface of fresh water jheels. Stem piped, jointed, many fathoms long; flowers rose-color. Stigma two-headed. The tender top and leaves are eaten in curries.

Chhágál Kuri (*Ipomea pes capræ*).—Leaves two lobed like *Bauhinia*, boiled and applied externally by natives in colic.

In sandy beaches it binds the loose soil, and renews it fit to bear new grass.

Teori (Ipomea Turpethum).—Roots rubbed up with milk used by natives as a purgative.

Bhuí Kámri (Ipomea Gangetica).—Stems strike innumerable roots from the joints; flowers a bright yellow, open late in the forenoon, and shut early in the evening.

Ban kalmí (Ipomea striata).—Fruit the whole year.

50. BORAGINACEÆ.—*Rough leaved*. Herbs having hairs rough to the touch; mucilaginous. Some contain nitre, and crack when thrown on the fire. The *Boraginaceæ* have round stems, while the *Labiataæ* have them square.

Hátsurá (Tiariidum Indicum).—May be seen at all seasons, with its blue lilac flower; it delights in rubbish and bye-ways. Its Sanskrit names are—*bhurundi*, earth-grower—*shrihas-tini*, what is held in the hands of the Goddess of Fortune. Stem dichotomous, *i. e.*, ramifies in pairs; juice of the leaves applied to painful gumboils, and to repel pimples on the face, and in Jamaica mixed with castor oil to relieve the pain of scorpion stings. Leaves wrinkled, margins curled. Flowers have no stalk, arranged in two rows on the upper side of the spike.

51. LABIATE (or Mint Order).—*Aromatic oil*. Lavender belongs to this order. Corolla two-lipped, and tube-shaped; stem square; tonics; aromatic oil in their leaves, which remains for years, even after the plants are dried.—Not so with the Jasmine order. Favorites with cooks and perfumers. Herbaceous plants; 1700 species.

Kála Tulsi (Ocimum sanctum).—This is a very sacred plant with the Hindus, being usually placed on a pedestal near a house or a temple of Vishnu. The myth goes that Tulasi, a female, wished to become the spouse of Vishnu but Lakshmi (his wife) in jealousy changed her into the Tulsi shrub; Vishnu however promised to be with her under the form of a *salagram* or holy stone, this stone

is accordingly placed by Hindus near it. In the month of May the tulsi is watered from a pot placed over it. In the Eastern islands, it is cultivated with great care for the purpose of strewing on graves. On the Srirámnavami festival, 9th of Chaitra, the birth of Ram Chandra, ceremonies are to be performed with the tulsi leaves. The Native doctors render the poison of snakes fit for use by stirring it with the filtered juice of tulsi leaves. Ten ounces of the juice with one drachm of quicksilver, half an ounce of sublimed sulphur, half an ounce of dhunes, one drachm of sohage, two drachms of goat's milk, made into a thin paste with vinegar, and rubbed over ring-worm, are found very useful. The stem and flower are dark purple; all fragrant. The Sanskrit name is *parnáśá*, beautiful leaved. In England, the *rosemary*, one of this order, is used as a symbol of fidelity, for wedding garlands, and to spread over graves.

Bábul Tulśi (Ocimum basilicum).—Its Latin name means *royal spice*. Sanskrit name, *mangoriká*, the beautiful. Flowers white. Seeds steeped in water swell into a pleasant jelly, used by Natives in cough and dysentery, very nourishing and demulcent.

Gulál Tulśi (Ocimum glabratum).—Flowers white.

Rám Tulśi (Ocimum gratissimum).—Flowers pale yellow, the most fragrant of all. The Chinese flavor many of their dishes with it.

Rám Tulśi (Ocimum ascendens).—No scent; flower pale rose-colored; stamens twice the length of the corolla.

Tulśi (Ocimum villosum).—Flower pale greenish rose-colored. Tender shoots clothed with much white soft hair. Juice of the leaves mixed with ginger and black pepper is given during the cold stage of intermittent fever; it is also prescribed to allay vomiting arising from irritation produced by worms. Sanskrit name, *arjaka*, the gainer.

Páthar Chur (Coleus amboinicus).—The juice is used in colic, dyspepsia, producing an intoxicating effect; in

Cochin China in cases of convulsion or epilepsy: flowers pale blue; rarely found in flower; stems creeping, succulent, fragrant, and eaten with butter.

Pání Kalá (Dysophylla verticillata).—Indian mint. Flower purple; filaments woolly. The *jal latá* or *Mentha fruticosa*, with its hairy stamens, belongs to this genus.

Pudíná (Mentha viridis).—Spearmint. Like the peppermint (*Mentha piperita*) does not flower in Bengal.

Bhu Tulsi (Salvia plebeia).—Found also in New Holland and China.

Gobará (Anisomeles ovata).—Fl. CS. Leaves downy; flowers reddish purple. The whole plant has a strong camphoreous smell.

Svet básanta (Leucas procumbens).—Creeping stem; calyx funnel shaped, ten furrows.

Chhota halkasá (Leucas aspera).—Leaves used as a pot-herb. The plant has a considerable degree of a peculiar fragrance.

Bara halkasá (Leucas cephalotes).—Calyx ten divisions.

Halkasá (Leucas linifolia).—Flowers used to decorate idols. The Ceylonese attribute almost miraculous curative powers to this plant. The leaves are bruised and a tea-spoonful of juice given, which is snuffed up the nostrils, and used by natives in the N. W. as a remedy against snake-bites; the mongoose also eats it. The fresh juice is employed as a remedy against head-aches and cold.

52. VERBENACEÆ.—In cold climates mere herbs but in cludes in India the *Clerodendron*, four feet high, and the teal two hundred feet.

Ban jám (Clerodendron inerme).—Flourishes near the sea

Bámanháti (Clerodendron siphonanthus).—Fl. HS. Greenish white, with very long tubes.

Bhánt (Clerodendron viscosum).—It is generally found under the shade of large trees, in consequence of birds dropping their seeds there. Stamens curved, ascend until fecundation is over, then decline; calyx red, stem quadrangular

leaves egg-shaped, but, when old, approach more to the lance-form.

* *Nishindá (Vitex negunda)*.—Leaves bruised are applied to the temples in head-ache; and to the leaves of books to prevent attacks of insects. Pillows are stuffed with them to remove catarrh. Sanskrit name *sinduvára*, near the sea—*indrasurás*, the best juice.

Segun (Tectona grandis).—*Teak*. Introduced into Bengal by Col. Kyd and Lord Cornwallis. Flowerstalk quadrangular; flint in abundance in its wood. Often rises to the height of 200 feet: the leaves 20 feet long by 16 broad.

Bhui okrá, or *chota okrá (Zapania nodiflora)*.—Found in Europe, North America and the isles of the Pacific. Sanskrit name, *vashira*.

Biná (Avicennia tomentosa).—Sunderbunds. Bark used in Rio Janeiro for tanning.

53. ACANTHACEÆ.—Herbs and shrubs. Seeds attached to curious hooked projections; leaves gave the model of the Corinthian capital. Calyx shaped like tiles. Bitter. Inhabit alike the marsh and moist and arid ground, the sea beach and the tops of the highest mountains.

Kántá kuliká (Asteracantha longifolia).—Flowers blue; stigma awl-shaped.

Shádá Játí (Barleria dichotoma).—Flowers white.

Játí (Barleria cristatá).—Flowers blue.

Kántá Jánti (Barleria prionitis).—Flowers yellow, and all the year; thorns in the axis of the leaves; leaves decussate, i. e., cross each other at right angles; stigma pitted. Very much like the common English holly.

Hákuch kántá (Dilivaria ilicifolia).—Found near brackish water. It flowers all the year on the Coromandel coast; in Bengal only during the rains. Leaves dentate, i. e., the margins having incisions like teeth. Calyx has three pair of caulets; anthers very hairy. Very common in the swamps near Galle in Ceylon. Leaves spinous like holly. The veins

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of the leaves are hardened at the extremity, and project in the form of thorns; the cause is that the development of the cellular part of the leaf is stopped, and a change takes place in the structure of the veins. Sanskrit name, *hankusa*.

Bàkas (Adhatoda Vasica).—It is a native of Ceylon. Fl. CS. The flowers have small ferruginous dots, and the lower part of both lips is streaked with purple. The corolla *ringent*, i. e., like a dog snarling. The wood is used for making charcoal by the Sikhs, and the flowers, leaves, and roots for anti-spasmodic purposes. The juice of the leaves is given in a dose of 2 drachms, with 1 drachm of the juice of fresh ginger, as an expectorant in coughs. Its Sanskrit names are *vajidántas*, flowers like a horse's tooth—*vaid-eamátri*, physician's mother—*vaideasingha*, medical lion, i. e., its flowers, leaves, root are anti-spasmodic, and are given in asthma and intermittent fever.

Jagatmadan, or Gandaras (Gendarussa vulgaris).—Bark, veins and leaves dark purple; the lower anthers have a spur-like process, projecting downwards and upwards. Leaves have, when rubbed, a strong, not unpleasant, smell, and are used, when roasted, in cases of chronic rheumatism.

Kála Jánti (Eranthemum nervosum).—Stems many. Flowers bright purple.

Udu Játi (Justicia dentata).—Flowers azure. To this genus belong the *chota michetá*.

Jui páná (Rhinacanthus communis).—Roots rubbed with lime-juice and pepper used to cure ring-worm: never ripens its seeds: supposed to be a snake antidote. Sanskrit name *Yuthaká parni*.

Bet rang (Peristrophe tinctoria).—Flowers in October.

54. SOLANEACEÆ.—*Potato tribe*. Nárcotics or stimulants. Plaited corolla. Used as food, medicine, or poison. Cooking or blanching destroys the poisonous properties, as in the potato, whose leaves and berries are narcotic.

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Káphri Marich (*Capsicum grossum*).—Flowers white. There is also the *lál langká marich*, with an orange fruit, the *haldí langká* with yellow, and the *dhán langká* called *chili*, because of its American origin. They are in Mexico to food what salt is in India.

Gorkhi (*Solanum rubrum*).—A common weed in Bengal, but in the Mauritius it is cultivated as a pot-herb. With flowers and ripe seed the whole year round.

Aras (*Solanum verbascifolium*).—In the Telinga country this is a tree; berry the size of a cherry.

Gota begun (*Solanum torvum*).—Leaves have flattened prickles. The *Godh begun* (tomato or love-apple) is of foreign origin.

Begun (*Solanum melongena*).—*Brinjal* or egg plant. In a poor soil they have many prickles, but in a rich one, few. Blossom and bear fruit the whole year. Leaves obliquely egg-shaped. The plants are annually raised from seed, though all the varieties are perennial, but, like the *chilis*, they are not so productive after the first year. Called in Sanskrit *sinhi*, the lion or pre-eminent egg plant. There is a variety, the *kuli begun* (*Solanum longum*) which has its fruit cylindrical, whereas the *begun's* is oval.

Byákur (*Solanum indicum*).—Berries a deep orange yellow.

Rám begun (*Solanum ferox*).—Leaves double.

Kantakári (*Solanum Jacquini*).—Berries yellow when exposed to the sun, white when sheltered. Sanskrit name *kshurika*, the scratcher, i. e., with its thorns. The seeds used in tooth-ache.

Ashva Gandha (*Physalis somnifera*).—Employed by the Telinga physicians as an antidote to poisons. Though naturally perennial, yet the plants are reared annually from seed, as they are not fruitful after the first year.

Tepariyá (*Physalis Peruviana*).—*Indian goose-berry*. Yellowish palatable berries, which yield an excellent preserve.

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Ban Tepariyá (Physalis minima).—Branches furrowed.

Dhutura or Thorn Apple (Datura-alba) Stramonium.—

Called the thorn-apple, as its fruit is a round ball surrounded with thorns. All over India, though not a native of India, but of South America. Of this Bishop Heber writes—

While to the cooler air confest
The broad datura bares her breast
Of fragrant scent, and virgin white,
A pearl around the locks of night.

Of the same order with the potato, though so violent a poison, as to be called “the rogue’s friend,” the seeds being used by thieves to stupify persons whom they afterwards rob. Similarly, the Scots once being compelled to supply the Danes with food, mixed bella-donna juice with it, and, during the state of intoxication that ensued, cut off nearly their whole army. The Malays use it for stupifying their victims. Called in Sanskrit, *khal*, the wicked tree,—*már*, death—*ummatta*, making mad—*kitáva*, a gambler—*dhurta*, cheating as a jackal—*dhustura*, destroying elegance—*kanáká*, shining—*sumana*, beautiful. In France it is called *herbe aux sorciers*, as also *trompette de jugement*. The fruit has four valves; thorny. The corolla is shaped like a funnel or trumpet, and plaited as it was in the bud; the calyx is angular; the capsule is four-valved. Eleven different species, some in Abyssinia, others in America. The dried leaves and roots of the *kála dhuturá*, called in England herb tobacco, are smoked for asthma, and the powder is used for violent head-aches; it enlarges the pupil of the eye. Seeds made into pills good for a decayed tooth. Chinese use it in tricks in trade. The juice is mixed with arrack, to make it more intoxicating. The calyx five cleft, breaking off after the flowering, leaving a wide ring round the seed-vessel.

Stramonium in the deep and death-like trance
Thy potent spell the spirit binds.

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The capsule encloses the stamens, and is covered with spines. †

The *kála dhutura* has the two sides of the leaves unequally ovate; pericarps tubercled, margins lobate, and flowers double. The leaf has several salient angles on the margin, and is angularly toothed. The dry root smoked removes spasmodic asthma. The seeds of the *kanak dhaturá* are never used medicinally, unless previously boiled with milk.

4TH SUB-DIVISION.—MONOCHLAMYDÆ.

One floral envelope, i. e., single, not consisting of calyx and corolla. Some of the best timber trees belong to this sub-division.

55. PLUMBAGINACEÆ.—Astringents. Corolla funnel-shaped.

Chitá (Plumbago Zeylonica).—Stems many-jointed; leaf-stalks channelled. The roots reduced to powder, and made into a paste, with a little congee, are applied to the skin to produce a blister; used in the South Seas also for the same purpose. The root used in combination with *bishtali* is applied in cases of enlarged spleen, and as a tonic in dyspepsias; in the Sandwich Islands it is employed to stain the skin permanently black. Corolla plaited, with a solitary seed, suspended in a curious manner by a spring, that arises from the base of the ovary, and twists over the seed. Sanskrit name *agnimukha*, fiery face. There is also the *rakta chita*, with red flowers; mixed with strong vinegar, it is rubbed on leprous sores.

56. PLANTAGINACEÆ.—Astringent.

Isáph Gul (Plantago Isphagula).—Seeds steeped in water used as an emollient for coughs; they are convex on the outside, concave within. Leaves three-nerved; flowers arranged like the tiles of a house.

57. NYCTAGINACEÆ.—Roots purgative. Flowers of some blow at night.

Krishna (Keli Mirabilis jalapa).—A native of Peru; introduced into the Calcutta botanical gardens about 1794. In Ceylon there are four varieties: purple, yellow, white, variegated. Called by the English “the marvel of Peru,” and by the French “the beauty of the night,” as it then expands its richly dyed corollas of various colours, yellow, white, red and white, red and yellow, hence from shunning the light of day, it was used as the emblem of timidity, as the sensitive plant was of modesty, which latter is affected by even a cloud passing over the sun. The females of Japan prepare with the powder of the seed a kind of white paint for their faces. The flower is only a petaloid expansion of the calyx, not a corolla. The stamens, inserted on the receptacle, grow from beneath the pistils, adhering together at the base, so as to form a kind of cup. If a skin of the leaf be lifted up a little, spots are observable, these are *raphides*, or needle-shaped transparent crystalline bodies, which are to plants what calculi are to animals; they are made of phosphate of lime. The base of its thin membranous calyx is converted into a tough or bony shell, which acts as a pericarp to the seed. The natives think its root is aperient; Europeans once thought that it was the true Jalap plant.

Gádá purná (Boerhaavia erecta).—Purgative and emetic, but heat removes those principles; common through India; its spindle-shaped root strikes so deep as to render it difficult to eradicate. Sanskrit name *purarnava*.

58. AMARANTHACEÆ.—Flowers in dense clusters; called the undying ones, because their flowers retain their bright colors even when dead, the closed calyx retains the leaves even when dead. Leaves sweet, gummy. Few in cold countries. Some of this species have high medical repute; and in Brazil they have a name which means good for every thing—as if everlasting flowers could confer immortality on man—yet they are mere pot-herbs.

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Laja Mahuriya (Digera muricata).—Stem, when young, erect, ever afterwards prostrate. Leaves and tender tops used by the natives in their curries.

Ghol mahini (Deeringia Indica).—A climber, has bright red berries; one of this genus, the *viridis*, used in Java for measles.

Ghinti Nati or Jil Chumli Chukni. (Amaranthus tenuifolius).—Leaves wedge-shaped, no stem, but lateral fibres of a bright pink.

Cheru Nati or Chila Nati. (Amaranthus polygonoides).—Leaves obovate, grows wild; used very much by native convalescents as a pot herb.

Champa Nati (Amaranthus polygamus).—Branches furrowed; leaves thin, shape of rhombus, bristly. Used in bilious disorders, and as an aperient. Sanskrit name *alpamarish*, a little enemy. There is also the *lál champa natiyá*, a reddish variety.

Gobará Nati (Amaranthus lividus).—Stem and leaf-stalks bright red, leaves dull greenish purple.

Shádá Nati (Amaranthus oleraceus).—Leaves vary in shape, from broad rhomboidal to egg-shaped and spear-shaped. The tops of the young stems and branches were formerly brought to table in India, as a substitute for asparagus.

Lál or Ranga Shúk (Amaranthus Gangeticus).—Various shades of red, like the species the English call “love lies bleeding.” If cut, no crop from the same root.

Bánsapát Nati (Amaranthus lanceolatus).—Means the bam-bu-leaved amaranth; capsule circumcised and wrinkled.

Lál Nati, or Rangá ká Nati (Amaranthus atropurpureus).—Leaves above a shining crimson, below purple.

Tun tun Nati, or Ban Nati (Amaranthus fuscicatus).—Green in every part, with the exception of a crescent-shaped fillet of paler green crossing the centre of the leaves.

Kántá Nati (Amaranthus spinosus).—Sharp spines in the axils of the leaves.

Chháyá (*Eruá lanata*).—Woolly branches, roots given in decoction, in strong whey.

Nuriyá (*Eruá scandens*).—A climber.

Shvet murgá (*Celosia argentea*).—Cockscomb, i. e., crested flowers. Some of the species appear as if they were *singed*, hence the name *Celosia*. Assumes very different appearances according to the soil or situation. Plants from the same seed have leaves of very various breadths.

Lál Murga (*Celosia aristata*).—Cultivated for the sake of its strange looking, beautiful, crested flowers. There is also the *haldí* or yellow sort. The flowers are astringent, and are used in diarrhœa.

Lálgul Makmal (*Gomphrena globosa*).—At first erect, by age spreading. Flowers crimson; the *saphed* is white. Sanskrit name *ámláná*. The native women wear them in their hair: in Catholic Europe they are used for decorating churches. Thus Milton—

Immortal amaranth, a flower which once
In Paradise, fast by the tree of life,
Began to flower.

Raktu shelenchi (*Psilotrichum ferrugineum*).—Stem four or five-sided and rust-colored.

Apáng (*Achyranthes aspera*).—Its botanic name so called, because its floral envelopes resemble chaff. Sanskrit name *madhukar*, honey-maker—*apamarga* the washerman, as the ashes are used in washing linen. Flowers bent back. Fruit nearly the whole year. Leaves green on both sides, dotted underneath, taken fresh and rubbed to a pulp are applied externally to the bites of scorpions. Root used on the Coromandel coast for a tooth-brush, in Bengal for snake-bites, and also in dropsical cases; given in an infusion as a mild astringent in bowel complaints. The flowering spike made into pills, with a little sugar, is a popular preventive medicine in Bahar for persons bitten by mad dogs. The

whole plant, when macerated, yields a considerable quantity of potash.

Daiya khaiyā (*Desmochata atropurpurea*).—Biennial. The flowers grow as if in a sheath.

59. CHENOPODIACEÆ.—*Indian cabbage tribe*. Leaves fancied to be shaped as a goose's foot, hence the name; no corolla. Sugar made in France from the beet, one of this order. Leaves of another of this order used in Mexico for tea.

Jadupálang (*Salicornia Indica*).—In salt marshes. Yield an ash valuable in making soap and glass. This genus *Salicornia* has but one stamen.

Ptnish (*Spinacia tetrandu*).—Used as a pot-herb. Leaves have triangular lobes; stem reddish.

Pálang Shák (*Beta Bengalensis*).—Belongs to the beet root genus, from which 9,000,000 lbs. of sugar are annually produced in France. The leaves are used by natives in curries. The mangel-wurzel belongs to this genus, and might be used in feeding cattle, as the roots often weigh 60 lbs.

Betu Shák (*Chenopodium viride*).—Leaves trowel-shaped. There are also the *lál betu*, the angles of the stem and branches are of a fine purple colour, and the *chandan betu*. The leaves of another kind, the *C. album*, stink like putrid salt fish.

Pui Shák (*Basella cordifolia*).—A valuable pot-herb, the Indian spinach. A climber. Its succulent branchlets and fleshy leaves protect native houses from the sun. The wild species, *rakta ban pui*, is also a climber, has its stem red; the beautiful purple juice afforded by the fruit might be used as a dye. There are also the *rakta pui*, *saphed pui*, and *ban saphed pui*.

* 60. POLYGONACEÆ.—*Sorrel Tribe*. Ditch growers; some however grow on sandy soils. Herbaceous. Leaves sheathing with large stipules, boot shape, acid; fruit a triangular nut. No calyx. Its jointed stems give the order the name *Polygonum*, i. e., many knees. Roots nauseous purgatives,

though the leaves are acid and agreeable ; no petals. The rhubarb belongs to this order, and the buck-wheat,—the rice of America.

Páni Marich (Polygonum flaccidum).—The sheaths which surround the stem are shaped like a boot. Leaves lance-shaped, but their base heart-shaped ; seeds three-sided. In the *bara páni marich* the ends of the succulent branches, on being wetted, become covered with a gummy substance. The *svel páni marich* has white flowers, woolly leaves, and a stem red internally, the stem below procumbent, striking root from the joints that rest on the ground. The leaves of one species give a good indigo dye, and those of another are smoked like tobacco.

Ban pálang (Rumex Wallichianus).—In Bengal abundant in dry weather, but perishes at the first approach of the rains. Calyx 3 leaved ; petals 3 ; seeds 3. Bitter and astringent.

Chuk pálang (Rumex vesicarius).—*Indian sorrel.* A favorite medicine in Arabia, cultivated all over Asia. Used in food for an acid curry, and as medicine. Sanskrit name *shatavedhin*, i. e., piercing one hundred times.

59. LAURACEÆ.—*Aromatic tonic tribe.* The camphor and cinnamon belong to it. Anthers burst by recurved valves. Naked fruit. Scarcely any species found on the continent of Africa.

Kukur Chitá (Tetranthera Roxburghii).—A native of the northern Circar hills, where it grows to be a middle sized tree ; anthers four-celled, with an oval lid to each cell ; leaves above shining ; bark astringent ; fruit yields a greasy exudation. The *bara kukur chitá* has the leaves downy beneath.

Ákash valli (Cassyta filiformis).—*Air plant* or Laurel dodder. A leafless parasite. Anthers, when ripe, spring from their enclosures.

60. ARISTOLOCHIÆ.—*Bitters and Climbers.* They form a link between Endogens and Exogens. Famous in South

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America and Egypt for stupifying snakes with. In South America the flowers of one species are so large that the children use them for hats.

Ishwar Mul (Aristolochia Indica).—Root very bitter, used in dyspepsia and for snake-bites; also the juice for coughs and asthma. The leaves, stalks, bark and root, are bitter; capsule hexagonal; flowers have one lip much longer than the other; the tube takes an abrupt bend near the middle. There are 6 anthers fixed very curiously on the outside of a club-shaped column, split into 6 lobes at the point. In the centre of this column is a style with a 6 rayed stigma.

61. EUPHORBACEÆ.—*Acrid milky juice.* Purgative. Used also for lining cloaks, named after Euphorbus, physician to a king of Mauritania, who first used them in medicine. Some of them thorny. About 2,500 species. Stamens and pistils not on the same flower; fruit ordinarily splits into three divisions when ripe; succulent stems.

Nabári (Cicca disticha).—*Indian cherry.* Leaves sudorific; seeds purgative; fruit eaten as pickles or preserves.

Amhá (Emblia officinalis).—Leaves bifarious, *i. e.*, placed in two rows; flowers in the beginning of the hot season; fruit ripe in eight or nine months after; bark used to cure diarrhoea and tan leather; fruit pickled; wood durable under water.

Shádá hójár Mani (Phyllanthus Niruri).—Fresh root astringent; a good remedy in jaundice. Leaves diuretic. In some of the species the flowers grow on the leaves.

Pánsioli (Phyllanthus multiflorus).—A climber. Juice used in ear-ache.

Khudiokrah (Crotophora plicata).—Seen on rice fields at the end of the cold season. Cloth, moistened with the juice of the green capsules, soon becomes blue, after exposure to the open air. Covered with white hairs, which gives it a hairy look.

Jaypál (Croton tiglium).—*Croton oil plant.* A native of China and India. A very strong purgative; one grain is sufficient as a dose, and five hundred doses may be contained in a small wafer box, and purchased for half a rupee. Hence its Sanskrit names *jaypál*, nourisher of victory—*danti*, subduing seed. In the *Rasa Ratnákár*, one drop of the oil of the *jaypál* seed in betel-nut, is recommended as a ready purgative for princes. The seeds are convex on one side, bluntly angular on the other. The resemblance of some of them to a tick, gave the name *croton*, so also of *ricinus*, as in the castor-oil plant. The lower flowers are female, the upper ones male and pale coloured. The leaves have a very nauseous taste.

Akkush (Rottlera laccifera).—A climber. Named from a Danish missionary in South India.

Bheránda (Ricinus communis).—*Castor-oil tree.*—Five seer of castor-oil nuts yield one quart of oil. The “gourd” under which Jonah sat near Nineveh was this tree, which was called by the monks, the great botanists of the middle ages, “*Palma Christi*”; they similarly gave to three hundred English plants religious names, such as “*Lady’s Slipper*,” “*Mary-gold*”; the Chinese use the oil for food, divesting it of its medical properties. The bark of the root is a powerful purgative. The tree often grows fifteen feet high, and thrives equally well on the burning plains and cold mountains of India. The stem is jointed, furrowed, of a heavy gray colour at the lower part, gradually acquiring a purplish hue towards the top; the calyx is reddish. The male and female flowers are placed on the same cluster; the male below, the female above. The leaves are shield-shaped, have the leaf-stalk fixed in their centre, instead of, as in other plants, on the margin, in divisions of from eight to twelve, of a bluish green colour, and are a favourite food of some silk-worms. The capsule contains three oblong flat seeds, which, when ripe, split through the middle cells. Seeds used to render colours

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permanent. Sixty thousand maunds of castor-oil were exported from India to Great Britain and other parts of the world in one year during 1856-57. The name *Jatropha* signifies food and physic.

Bāgh Bheranda (Jatropha curcas).—Angular leaved physic nut. The oil expressed from the seeds is used only by poor natives for lamps. The seeds are violent purgatives, hence its Bengali name signifies an oil fit only for tigers; it is used however externally in itch and pimples, as also a little diluted for chronic rheumatism. This oil, boiled with the oxide of iron, is used by the Chinese as a varnish for boxes. The milk juice dyes linen black, and is considered healing and cleansing. The leaves are five-angled, have a leaf-stalk five inches long; they are applied, warmed and rubbed, with castor-oil, to cause boils to break. On the Coromandel coast in fruit and flower all the year; wood useless, not even fit for burning. The trunk irregular, from being constantly kept low for hedges.

Akhrot (Aleurites triloba).—Indian walnut. Originally from the Malay countries; a native also of the Society Islands. The nuts are two, irregularly furrowed, have green veins; the kernels taste like fresh walnuts, and yield a pure palatable oil; in the Sandwich Islands they are employed for candles, 31½ gallons of the nut yield 10 gallons of oil. It is manufactured in Ceylon; the cake, after the expression of the oil, forms a good food for cattle, and also an useful manure. The seeds exude a gummy substance which the natives of Tahiti chew. The branches fall off soon, spread and ascend; the leaves are heart-shaped, the margins often scollop-toothed, when young covered with a down. The leaf-stalks have two hemispheric glands at their apex.

Svet basanta or mukut juri (Acalypha Indica).—A singular cup-shaped involucre surrounds the flowers. Botanic name means not beautiful to the touch, i. e., it stings. Leaf-stalks as long as the leaves. A decoction of the leaves is laxative, .

rubbed on children's tongues excites vomiting. Cats are as much affected by the roots as by those of *Valerian*; bruised in hot water they are purgative. Sanskrit name *manshinká*.

Bichati (Tragia involucrata).—The hair stings like the common nettle. Its root used by Hindu doctors for an inflammatory state. Twining.

Batan or Huruya (Sapium Indicum).—Juices very poisonous; taste of the fruit excessively nauseous; seeds used to intoxicate fish.

Mom Chiná or Chelát pipul (Stillingia sebifera).—China vegetable tallow. In China candles are prepared from the fatty matter which envelopes the seeds, the oil used for lamps.

Sij (Euphorbia nivulia).—Common prickly pear. Stem irregularly angled like *phani manasá*; delights in a barren soil. The milky juice used as a purgative, and the pulp of the stem mixed with green ginger, is given to persons who have been bitten by mad dogs before the accession of hydrophobia.

Manasá Sij (Euphorbia ligularia).—Sacred to Manasá, the snake goddess; in July and August, on Tuesdays and Thursdays, the Natives approach the tree with offerings of rice, milk, and sugar, praying to be delivered from snake-bites; however they employ a surer means, by mixing the root with black pepper, as a remedy in bites. There is a festival, *Manasa panchami*, in honour of Manasá, who, while the Gods were sleeping, sat in the shape of a snake on a bunch of *snuhi*, to preserve mankind from the venom of snakes. The Native doctors purify arsenic, by making a hole in the green trunk of the *manasá*, filling it up with solid arsenic, and, after being covered with the bark of the same plant, the whole is exposed to a good fire, until the external parts of the trunk are completely charred, when the arsenic is taken out, and becomes fit for use. The leaves have the shape of a wedge, and are waved, have few veins, and fall off in the cold season, but appear again in April.

The branches are five-angled. The young shoots of the branches are spirally disposed, and armed with elevations like the teeth of the largest saw, each of these supports a leaf, and a pair of black stipular thorns. The juice is used to remove warts. The *Nará Sij* (*Euphorbia antiquorum*) has triangular branches, the juice mixed with *til* seeds used in rheumatism and constipation. Sanskrit name *bagra*.

Lanká Sij (*Euphorbia Tiraculli*).—Milk bush. In Madras called the milk hedge. The acrid juice used as a blister, and yet goats eat the plant with impunity. Sanskrit name *bajra tunda*. Germans called it the Malabar wolf's milk.

Chhota Kerui (*Euphorbia Chamæsyce*).—Branches spread flat on the ground: the *bara kerui* is hairy. There is also the *shvet kerui*, another species is the *chágal patpati*.

Rang Chitra (*Pedilanthus tithymaloides*).—Introduced into Bengal about 1790, juice used in wounds: employed for hedges, as neither cows nor goats will touch the leaves. The green leafless branches look somewhat like gigantic rushes.

62. URTICACEÆ.—*Nettle tribe*; includes plants very opposite in nature, such as fig, jack, nettle. No corolla; the stamens erect at first, spring back with elasticity to discharge the pollen.

Chundra Muli (*Urtica interrupta*).—Loves a shady situation. Stems streaked; roots spindle-shaped, eaten raw, boiled or roasted; leaves three nerved.

Lál Bichhati (*Urtica interrupta*).—The snakes of the vegetable kingdom. Hairs sting like the common nettles. At Chittagong is a nettle, *Urtica scabreila*, which though rough to the touch, does not sting. The Botanic Garden, Calcutta, has nettles from Chittagong, Rohileund, Ceylon, Sumatra, Malabar, Circar Hills, Moluccas, Japan, Bareilly. In *Timor* is the *Urtica urentissima*, called the Devil's leaf, the pain from its sting lasts for years, and amputation of the limb is often necessary to avoid death, yet when dried, it is readily

eaten by sheep. The structure of the sting is like that of the rattle-snake's fang, each consisting of a tubular stilet perforated at or near the fine extremity, it widens at the lower end into a chamber at the bottom of which is seated a gland, which secretes an acrid juice, and when the finger presses the stilet its needle-like point enters the flesh, and the force required for this presses it down in the hollow chamber, so that the poison stored up there rises through the channel of the stilet, and is deposited beneath the cuticle. The tops of the English nettle are boiled and eaten. A decoction of nettles strongly salted coagulates milk readily. The roots boiled with alum will dye yarn of a yellow colour. In Siberia cords, cloth, and paper are made from the fibre of nettles.

Kunchura (*Urtica tenacissima*), of the Eastern districts of Bengal, *Rheea* of Assam. By the exertions of the A. and H. Society of India, this plant has been proved to be identical with that yielding the fibre of which the "grass cloth" of China is manufactured. The *Kunchura* is probably, the strongest fibre with which we are acquainted, excelling Russian hemp in strength, and equalling Irish flax in fineness of texture.

Ganjā (*Cannabis sativa*).—*Hemp*. *Bhang*. Leaves added to tobacco, increase its intoxicating power, hence its Arabic name, signifying increase of pleasure, cementer of friendship, exciter of desire, leaf of delusion. The Hindus and Chinese, Turks and Hottentots, use it instead of spirits. The fibre being very tenacious, is used in commerce, particularly by Russia. The hemp plant destroys almost every other plant that grows in its neighbourhood. In Nepal, linen is made of it. It is used in medicine in cases of diarrhœa: this medicine is procured from a resinous juice on the plant. The *gunja* is the dried plant used for smoking; the *bhang* is the larger leaves, one pice worth suffices for intoxication.

Tut (*Morus Indica*).—*Mulberry*. Cultivated to feed silkworms, stripped of its leaves twice in the year for that

purpose. The inner bark used by Chinese for paper, and also for ghêe. Sanskrit name *tula*.

Dumur (Ficus carica).—Leaves angular, lobate or palmate, three-nerved, rough above, downy below. The chief article of food near the Mediterranean, used also for poultices. In some climates it yields a treble crop. Sanskrit name *udeombar*. The *bhui dumur* is somewhat creeping. Thirty-four species in the Calcutta Botanic Garden. All plants of the genus *Ficus* make animal fibre tender.

Bat (Ficus Indica).—*Banyan tree*. Called by the Portuguese the rooting tree; its Sanskrit name is also *shiphâ ruha*, fibrous-rooted. The branching roots are merely props to the heavy branches, they never produce a single branch or leaf; in Kumaon, the mountaineers use the elastic fibrous roots for poles on the mountains, but they are not cut till the supposed indwelling arborescent god is appeased by the sacrifice of a goat. The fruit is of a pale red colour: the seeds are used by the Tamuls as cooling and tonic. The white glutinous juice, which issues when the stalks are bruised, is used for tooth-ache, also for cracked feet, and bird-lime, and has some of the properties of India-rubber. The bark is used as a tonic. One near the Nerbudda was so branchy that 7,000 persons sat under its shade; it had 350 trunks, and was 2,000 feet in circumference. On Vaisaki 16th, *Savitri britanta*, is a fast observed with ceremonies by Indian women at the root of this tree, to preserve them from widowhood. Milton's famous lines are beautifully descriptive:—

Branching so broad and long, that in the ground
The bended twigs take root, and daughters grow
About the mother tree, a pillared shade
High overarched with echoing walks between.

The one in the Calcutta Botanic Garden is 550 in circumference. Birds sometimes drop the seeds of the *bat* in the Palmyra tree, the *bat* spreads till it covers all the Palmyra

except the top. The Hindus say this is a holy marriage instituted by God.

Káshmir (Ficus elastica).—Indian-rubber tree.—A native of Sylhet. Stipules nearly as long as the leaves, which are highly polished on both sides. The caoutchouc which comes from this tree, was discovered accidentally by Dr. Roxburgh in 1810. The natives of the Jaynti Hills have for ages used the juice for lining baskets, and for candles.

Pipul or Aswath (Ficus religiosa).—The Indian aspen leaf, its tremulous motion is owing to its long leaf-stalk, which is twisted by the weight of the leaf when acted on by the wind. It is sacred to the god Vishnu, who was born under its branches, hence the cutting it is counted an unpardonable sin, not to be atoned for even by sacrifice, fortunately the wood is useless, so there is little temptation. The Buddhists regard it as their holiest tree, and say that the egg-shaped leaves, suddenly tapering to a point, always tremble out of respect to Gotam, who sat under its branches. On the fleshy part of the leaf being removed, and the skeleton varnished, most beautiful drawings of insects, birds, and flowers, are made by the Chinese. In Candy the form of its leaves was allowed to be painted only on furniture employed exclusively for the king's use. Bird-lime is made from the juice of the stem; the leaves of this, as well as of the castor-oil plant, are given for feeding silk-producing worms, this is one cause of the strong wiry nature of Indian silk. The lac insect delights on its twigs. The fruit comes out on the branches. Its Sanskrit names are *chaladala*, quivering branches—*pippala*, the preserver—*kungarasan*, elephant's food—*ashvattha* not durable. The trunk, when old, has many ridges and hollows, as if many trunks were united: the bark is deemed a good tonic.

Gayaswath (Ficus cordifolia).—Fruit black, perfectly round; leaves narrower, and with points much shorter than in the aswath.

Pákur (*Ficus infectoria*).—Noted for its branching roots and beautiful head; bark very tough; stipules grooved with a coloured gland round their apices; fruit the size of a pea, when ripe, white.

Yágua, Dumur (*Ficus glomerata*).—A tree loving water courses. The under side of the leaves taper equally towards each end, covered with minute green dots; leaf-stalks channelled; bark rough; fruit eaten by the natives. There is also the *kák dumur*, whose leaves are net-shaped, and beautiful; yields an abundance of milk juice.

Kántál (*Artocarpus integrifolius*).—*Jack*. Noted for its fruit, seventy or eighty pounds in weight, formerly a favorite with Europeans in India, though the scent is unpleasant. The yellow viscid, milky juice furnishes bird-lime. Its dark-green shining leaves and deep shade render it useful as a shelter. The wood, of a handsome yellow orange tinge, is used for furniture. Root, bark, wood yield a yellow dye. The finest fruits sometimes grow on the roots, when the tree gets old, but when middle-aged from the trunk, and will be found by observing the cracking of the earth above them; the fruit issues direct from the stem. In Ceylon, the trunk is sometimes twenty feet in circumference. The stamens grow on a sort of long cluster, the pistils on a round one. Sanskrit name *punasi*. The *Artocarpus incisa* (*bread-fruit tree*) grows near Bombay, its leaves are notched.

Deophal (*Artocarpus lacorcha*).—The fruit is eaten when unripe, contains much milky juice; roots give a yellow dye; bark very rough; the leaves have a beautiful net-work between the parallel veins.

Sheorá (*Trophis aspera*).—Milky juice applied by natives to sores and sand-cracks in the feet. Leaves used to polish ivory: and also for fuel. Berries greedily eaten by birds.

61. PIPERACEÆ.—*Pepper tribe*. Creepers. Burning taste, but aromatic smell. Several hundred species, but only two genera. 54,000,000lbs. of pepper produced annually.

Pippul (Piper longum).—Made from the dried fruiting spikes when unripe. A native of the Circar mountains, Sanskrit names *videhi chapala*, *ushana*. There is also the *choi* or *piperchaba*, Sanskrit name *chavi*.

Pán (Piper betel).—A native of the Indian Archipelago. Chewed with lime it is used for its intoxicating power, for allaying the calls of hunger, and for sweetening the teeth. Sanskrit names *nágaváli*, *tambulavali*.

62. SALICACEÆ.—*Willows*. Bark astringent, used in tanning and fevers. 200 species known; only one in India. Wood very good for charcoal.

Páni Jamā or *Báisi (Salix tentrasperma).*—The leaves are green above, hoary below. The bark gives a tonic substance.

(To be continued.)

Production of palm sugar in the Province of Pegu.

IN October, 1856, Mr. S. H. Robinson, a member of the Society's Sugar Committee, reporting on some sugar-cane from the interior of Sugeini and the islands round Moulmein, made the following suggestion:—

“If the Society has any members located at Toungoo or Prome they might probably be able and willing to furnish some interesting information, and also samples of the palm sugar produced in those parts. The American missionary, Malcolm, whilst travelling up the Irrawaddy in 1856, mentions the very large production of jaggry from two kinds of palms, viz., *Cocos Nypa* and a *Borassus*, and he says there are several varieties of the latter genus cultivated. The jaggry, he mentions, was of good quality, and selling at one-third of a penny per pound, equal to about one rupee two annas per Calcutta bazar maund.

• Looking at the rising importance of date sugar in Bengal,

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the fact of an abundant supply of a similar product so near to us as the Irrawaddy, is certainly worthy of further attention and investigation."

The following correspondence furnishes the result of an enquiry made through Major Phayre, the Commissioner of Pegu, in accordance with the above suggestion:—

To the SECRETARY OF THE AGRICULTURAL and HORTICULTURAL SOCIETY, CALCUTTA.

SIR,—I have the honor to acknowledge the receipt of your letter dated 17th December, 1856, forwarding memo. regarding the production of palm sugar or jaggry in this Province.

2. In reply, I beg to inform you that the only part of the Province in which the sugar is manufactured to any extent is in the district of Prome, and I herewith forward copy of letter No. 152, dated 21st January, 1857, from Major Allan, Officiating Deputy-Commissioner, Prome district, and letter No. 63, dated 2nd March, 1857, from Captain Spilsbury, Assistant-Commissioner of Henzada, and letter from Assistant Commissioner of Toungoo, No. 12, dated 13th February, 1857, in which full particulars will be found regarding the nature and extent of the manufacture.

2. In two other districts only, viz., Toungoo and Henzada, are the palm trees yielding sugar planted by the inhabitants, and that only to a limited extent. The people of these districts manufacture raw sugar or jaggry sufficient for their own consumption, and not more.

3. The specimens of sugar mentioned in Major Allan's and Captain Spilsbury's letters will be forwarded by the steamer "Fire Queen" to your address.

I have, &c.,

A. P. PHAYRE,

PEGU COMR'S. OFFICE, RANGOON: *Comr. of Pegu and Agent*
April 7th, 1857. to the Govr.-Genl.

To the COMMISSIONER OF PEGU, and AGENT TO THE GOVERNOR-GENERAL.

SIR,—I have the honor to acknowledge the receipt of your Revenue Letter, No. 327 of the 3rd December, 1856, annexing extract from proceedings of the Agricultural and Horticultural Society, on the subject of sugar procurable from palms, and desiring a report to be made on the following points :

The juice is extracted from two kinds of palms, a description of both is given at foot.

1st. Is the juice extracted from one description of palm or several ?

Borassus flabelliformis, (Palmyra palm,) in Burmese

2nd. What are the Botanical names of these palms ? *Tambur.*

The 2nd *Corypha taliera*, (Book palm,) Burmese name *Paybin.*

As nearly as can be ascertained 80,000 viss, is produced

3rd. What is the quantity yearly in the district of Prome. A viss equals 3.65lb avoirdupois.
of the raw sugar supposed to be produced in the Prome district ?

Half, or 40,000 viss, is supposed to be used in the

4th. Is the sugar generally consumed in the district, the other half is exported.
or is a portion exported ?

It is sold on both banks of the river, ~~from~~ Akauk-

5th. If any sugar is exported, state whereto ?
Toung to Rangoon ; a portion finds its way to Moulmein, Showygyuer and Sitang, because little, if any, is manufactured south of Prome.

The price of jaggry made in the Prome district is at

6th. What is the ordinary price of the palm sugar per viss in the district ?
present in the bazar 5 annas a viss that made in the Burmese territory is 3 annas 3 pie the viss ; specimens

. (2 viss) of both kinds are forwarded.

7. As before mentioned, there are two descriptions of palms from which the palm sugar is made—the *Borassus flabelliformis*, Common palmyra palm—and the *Corypha taliera*, or book palm; for commercial purposes the latter is of no account. Jaggry is almost entirely procured from the former. As a general rule, the palmyra takes in this district twenty-five years to arrive at maturity, unless the soil is a rich one where a twenty will suffice. After these periods, it commences yielding juice, and continues to yield it for seventy or eighty years more; the tree may therefore be said to live one hundred years. The female palmyra palm is tapped in March and juice drawn from it till the end of May. The spathes being now too short from constant cutting, it is allowed to rest the whole of June, it is again drawn from July to the end of September; a second rest is allowed in October, and a third in February, so that for 9 months in the year the tree yields its fluid. A good female tree will yield 9 quarts a day, an indifferent one only 3. The quality also varies. The juice of some trees contains a larger amount of the saccharine ingredient than that of others, thus while ten quarts drawn from one tree will return

* One ticul=252 grains troy 20 ticuls* weight of jaggry, that from another will only give half that quantity.

8. Toddy is drawn from the male palmyra palm for two months in the year only, January and February, the quantity equals that given by the female, but the saccharine matter is invariably less, estimated by the people at one-third.

9. The second description of palmyra, the *Corypha taliera*, produces juice after arriving at the age of 50 or 60 years, it yields it for 6 months of the year only, after which the tree dies; it will give as much as 20 quarts, but the jaggry produced, is much less in proportion than that given by the common palmyra. The tree is comparatively scarce, and, as mentioned before, is commercially of no account.

The leaves are used by the priests for their sacred writings, and by the common people for short documents of importance.

10. The palmyra is sometimes planted; many grow spontaneously from the fallen seed of surrounding trees; the nut of the young palmyra is sold in the market, and used as an edible by the people, who either roast or boil it.

11. The jaggry in the Prome district is produced principally on the east side of the Irrawaddy, hardly any comes from the west side, and very little if any is made to the southward of it. The tree becomes much more common and plentiful to the North. In Burmah proper last year 34,280 males, and 25,794 females, total 60,074, paid tax; but I should think this can hardly be more than one-tenth of the number of trees in the district.

12. The quantity of jaggry imported from Burmah Proper in 1855 amounted to 1,465,695
* Information received from Collector of Customs, Thayet-myo. viss, it fell off in 1856 to 1,219,371
viss.* The quality is not so good

as that of Prome, the juice of the latter being 5 annas a viss while the former is only 3 annas 3 pie. The people in Upper Burmah boil with their juice, the bark of a tree,

† Botanical name not known. named by them the tanning tree.†

The bark gives the jaggry a dark, glassy look, but deteriorates the quality. Before the occupation of the province by the British, Prome jaggry sold in the bazar at from $1\frac{1}{2}$ annas to 2 annas: jaggry manufactured above was hardly if ever used in this part of the country; increase of prices will of course insure the production, and this though of great consequence to the people themselves, yet the maximum amount of jaggry ever likely to be manufactured in the Prome district, can never materially affect the general consumption.

I have, &c., &c.,

PROME:

(Signed,) G. ALLAN,

January 21st, 1857.

Offg. Depy.-Comr.

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To the COMMISSIONER OF PEGU, and AGENT TO THE GOVERNOR-GENERAL.

SIR,—With reference to your letter, Revenue No. 327, dated 3rd December, 1856, I have the honor to reply that sugar is not made in the district, with the exception of a very small quantity occasionally in the Okpho township for immediate consumption. What is generally used there is imported from the up-country. In the other townships I am informed none is made. The trees from which the juice is extracted are two species of palm, called by the Burmese A-Hpobeng and A-Mabeng; in the latter the juice is more plentiful, and is extracted from the fruit by crushing and pounding; the A-Hpobeng or male tree yields far less, and that is extracted similarly from the suckers or shoots.

2. The trees are two species of the palm tree, but their botanical names I have been unable to discover.

3. The price of the sugar is 4 annas a viss, but it is so scarce that I have only been able to obtain one viss of it, made in the district, which I now transmit.

I have, &c.,

DY.-COMR'S. OFFICE, HENZADAR : E. J. SPILSBURY,
March 2nd, 1857. (Sd.) *Assist.-Commissioner in charge.*

To MAJOR A. P. PHAYRE, *Commissioner of Pegu.*

SIR,—With reference to the subject of your letter per margin, I have the honor to inform you that sugar is not prepared from any of the palms of this district. From the juice of the "Khari" (*Borassus flabelliformis*) and the Kpai (*Corypha umbraculifera*) a coarse jaggry in a semi-fluid state is made for consumption in the place, but none is exported, and the article is so inferior as to bear no mercantile value for such a purpose.

I have, &c.,

TOUNGOO : (Signed,) E. O'RILEY,
February 13th, 1857. *Assistant-Commissioner.*

To the MEMBERS OF THE SUGAR COMMITTEE.

GENTLEMEN,—I have the pleasure to circulate, for a report, thereon, two musters of “Goor or Jaggry” prepared in the districts of Prome and Henzada from the *Palmyra* tree. “Tal-gach,” (*Borassus flabelliformis*).

These musters have been sent by Major Phayre, Commissioner of Pegu, whose letter and enclosures are circulated for your perusal.

Yours faithfully,

CALCUTTA :

June 22nd, 1857.

A. H. BLECHYNDEN,

Secretary A. and H. S.

Minute by Mr. S. H. Robinson.—These samples are of very inferior quality as raw material for making marketable sugar : that from Henzada I do not think could be used for such purpose at all ; and the Prome sample I do not think could be made to yield more than 25 per cent of clean crystallized sugar. As both appear to be made with the object only of being consumed in their present raw state, it is probable that if more carefully prepared, a much more valuable product for sugar manufacture might be produced from the same juices, inasmuch as these samples are very sweet, and free from any disagreeable flavour. As materials for distillation they would both be very valuable, and on the average of years would be well worth for that purpose, the usual market price of $1\frac{1}{2}$ to 2 annas per viss (equal to about Rs. 2 to Rs. 2-12 per bazar md.) as quoted by Mr. Allan in his letter, although this is much higher than the price quoted by Malcolm in his “Travels,” where he says that between Poghon and Ava the price was $\frac{1}{3}$ of a penny per pound, or about Rs. 1-2 per bazar md. As so large a quantity is imported “from Burmah Proper,” equal to 60 to 70,000 bazar mds. annually, it is probable that the price of this at the place of production may still be more approximate to Malcolm’s price above referred to, as current in 1836.

Note on Lac Wax.

Minutè by Mr. James Cowell.—I have examined these samples of goor or jaggry made from the Palm tree. The Henzada produce could not, I think, be converted into sugar, as it does not appear to possess any crystallizable property, probably from not being boiled until the juice had run into a state of incipient fermentation. The Promo muster is somewhat better, and might crystallize in the pan to a small percentage of sugar. Both the samples are replete with sweetness, and would yield largely of spirit to the distiller. It is difficult to quote a value for these samples, but in the present scarcity of all materials for the purposes of refining and distilling at Calcutta, I am of opinion that these goors would fetch Rs. 2 to 2-4 per bazar maund at least, and in ordinary times about one Rupee per maund for sweetmeats and other uses.

May 27th., 1857.

Note on Lac Wax: By GEO. EVANS, Esq.

I have to apologize for the delay in sending you the promised note on the lac wax I left for the Society's museum.

The specimen in question is a small portional result of a chemical process for which I obtained letters' patent in 1843, for treating the several sorts of unmanufactured gum lacs known in the English markets as distinct from shell lac, and which, from their impurity, were then, and are still, of little value compared with the latter prepared article. The object was to convert them into more saleable and higher priced shell-lacs of commerce, by a mode of preparation which freed them from their defects most effectually. At that time an increased demand had sprung up at home for shell-lacs of every description, consequent on the sundry novel uses to which this highly useful resinous gum had of late years been applied, more parti-

cularly in the manufacture of light silk hats in place of the nearly obsolete heavy beavers, now as seldom seen or heard of as an old tinder-box, or a superannuated Charley of our school-boy days' reminiscences, also in the fabrication of French polish, now so universally made use of to brighten up our modern furniture.

The process of manufacturing shell-lac in this country, though extremely simple, and most admirably adapted to the purpose, is wholly unattainable at home, where labour is expensive and the habits of the people so widely different. The want also of the smooth-surfaced, supple and moist plantain junk, on which the lamination is performed by the natives, is also an insuperable barrier to its preparation there; chemical aid was therefore resorted to, to obtain the object had in view, and by alkaline solutions, and subsequent decomposition with sulphuric acid, the lac was obtained in a perfectly pure state, differing only in colour from the most approved qualities, according to that of the article from which it was made. The plan so far succeeded, that a considerable quantity was manufactured and sold in the London market, realizing fair prices, but supplies failing to be regularly kept up from this country, and they often varying much in their properties, difficulties arose, and the prices shortly after not warranting a further extension of the manufacture, it was abandoned, after a considerable loss of money, as an unprofitable undertaking, though the fact of the possibility of making it was fully proved. The wax was obtained in the process of solution, and the boiling the crude lacs underwent, but not in sufficient quantity to make it an article of commercial value, one per cent being about as much as they would yield. It was therefore collected more as a matter of curiosity, than with any other specific object.

I cannot speak as to any peculiar properties it possesses, further than being of a harder, and more resinous con-

Note on Lac-Wax.

sistence than common bees' wax, having an agreeable aromatic odour, which it seems it is permanently retentive of, the specimen having now been made these last fourteen years, still retaining its perfume.

I have neither estimated its specific gravity, nor ascertained its melting point, but I found that it readily combined in any proportion with paraffine, spermaceti, bees' wax, some of the resins, tallow, and the animal and vegetable oils, with some of which, tallow in particular, it made very excellent candles, yielding a bright and pure light, but like most of the rich hydro-carbons, it gave off much smoke when burnt by itself.

The use to which it would appear to me to be best adapted, provided it could be obtained in quantity, would be for making castings, and taking impressions of coins, medallions, &c., the slight degree of contractility it possesses, its rapidity of setting, its peculiar hardness and freedom from stickiness, and other properties, causing it to quit freely the mould or object on which it has been applied, while its non-liability to be affected by atmospherical vicissitudes (after a slight admixture with bees' wax) would make it highly useful for large seals, such as are inconveniently attached to our patent right parchments, which appear to be made of common white resin, and by consequence are brittle, sticky and extremely unpleasant to handle.

These are the only characteristics of the article I can at present recollect as worthy of note. Could it be largely obtained, it would take up no second-rate place with the best of the above-named highly valuable articles of commercial and domestic economy.

By high distillation, I found it to yield a rich fluid hydro-carbon, so highly ethereal, that on pouring it from the mouth of a bottle it evaporated before reaching the ground, and had much the property of eupione.

In the course of my experiments I found some of the seed lacs to contain a gum analagous in some respects to basserine, and which resisted the chemical agents I had occasion to employ.

CALCUTTA:

April 18th, 1857.

Report on specimens of Fibre, &c., from Arracan, Berhampore, Gorruckpore, and the vicinity of Calcutta.

To the MEMBERS OF THE HEMP AND FLAX COMMITTEE.

GENTLEMEN,—I beg to circulate for the favor of your inspection and opinion, certain specimens of raw fibre, rope, matting, and straw, thirty-one in all, which have been received by the Society during the last six months. A detailed list of these specimens is annexed, and certain letters and printed papers explanatory thereof are circulated.

I am, &c.,

METCALFE HALL:

April 24th, 1856.

A. H. BLECHYNDEN,

Secy. A. and H. S.

List of sundry specimens of Fibre received by the Agricultural and Horticultural Society from November, 1855, to April, 1856.

First.—Specimens from Arracan forwarded by Lieut. F. W. Ripley, Asst.-Commissioner.

A 1. "Yaseng Shaw" (a species of *Sterculia*) two samples.

A 2. A piece of the bark of the "Nan" creeper, a species of *Gnetum*.

B 1. Fibre of "Nan Shaw."

B 2. "Koong Thenban Shaw."

B 3. "Panpeng-Shaw," a small kind of "*Hibiscus*."

B 4. Plantain fibre from *Musa Aranakensis*.

B 5. Pine-apple fibre.

B 6. Fibre of the "Ramturai," or "Beyndee," or "Dheeroos." (*Hibiscus* or *Abelmoschus esculentus*.)

C 1. A roll of sacking made from the "Shaw Ne."

CC 1. Bast matting made from ditto.

CC 2. Ditto, from do.

Some particulars respecting the above specimens will be found in the accompanying letters of Lieut. Ripley, dated respectively 3rd Sept., 1855, 8th Dec., 1855, 5th of Feb., 1856, and 7th March, 1856.

The above four specimens of "Shaw" (A 1, B 1, 2 and 3,) are new to us, with the exception of the "Thenban Shaw," which was sent by Lieut Ripley in 1854. (See notice of it in *Journal*, Vol. IX, Part. 1, pp. 143-145; a copy of which is circulated for reference.) The "Shaw Ne," or Red Shaw, of which the above specimens of sacking (C 1, and CC 1 and 2,) are made, is also noticed in the same number of the *Journal*, see pp. 141-145.

Second.—Specimens from Berhampore, forwarded by Mr. Michael Betts, Superintendent Branch Society's Garden at that station, in a letter dated 26th Dec., 1855, of which the following is extract:—

D 1 and DD 1., the fibre of the "Ramturai" *cleaned and uncleaned.*

D 2. A sample of 1½ inch rope made of that fibre, and also of the fibre of

D 3. Which the natives call "Magnaut Paut," that the strength of loth may be tried.

D 4. The fibre of an *Hibiscus* plant, and

D 5. The fibre of the Aloe plant.

Third.—(E).—A fibrous bark from Gorruckpore, received from J. H. Bridgman, Esq., whose letter dated 26th Feb., 1856, and Mr. W. Watson's letter of the 7th March, accompanies.

This bark is not unlike Lieut. Ripley's "Yaseng Shaw."

Fourth.—(F).—Fibre of *Sida Asiatica*, the produce of the Society's garden, prepared by Mr. McMurray in Decr, 1855.

The following is extract from the Gardener's Report for December, regarding the above fibre:—

"In my report of Nov., 1854, accompanied by the *Sida rhomboidea* fibre, I remarked that the *Sida Asiatica* plant was likely to yield a fine description of fibre, if brought under careful cultivation; this has been done on a small scale in the garden during the last season, and I now forward the produce for laying before the present Meeting.

Some particulars respecting the *Sida rhomboidia* fibre, (which appears to be superior to *S. Asiatica*,) will be found in the number of the *Journal* previously referred to, pp. 146-150. We have not yet received reports on the first named fibre from the Chamber of Commerce at Dundee, or Messrs. Marshall and Co., of Leeds.*

Fifth.—Twelve specimens of flax straw and raw fibre, raised at Goosree by Mr. John Stalkartt from Agra, Dutch, and Saharunpore seed, received from the Society namely:—

G 1.—(Two samples).—*Unheckled* flax from Riga and Dutch seed steeped for 48 hours, the first week in March.

G 2.—The above in a *heckled* state.

G 3.—*Unheckled* flax from Dutch seed, steeped 36 hours, the first week in March.

G 4.—*Heckled* flax from Dutch seed, steeped 13 hours.

G 5.—Riga flax, white and green sorts, the former steeped 5 days, the latter 3, at end of February.

G 6.—Saharunpore *heckled* flax, steeped 3 days at end of February.

* "Of all the likely plants I have seen, the *Sida rhomboidea* appears to be the best, and I sincerely trust India will send us plenty of it soon. Do use every exertion to have it cultivated, and sent home as a regular mercantile article, and I see no reason why we should not use as much of it as we now do of jute." (Extract of a letter from the Secretary Chamber of Commerce at Dundee, dated 27th February, 1857.)

G. 7.—Patna flax *unheckled*.

G. 8.—The above in a *heckled* state.

G. 9.—A specimen, *not steeped*, but dried in the sun 6 hours, and then crushed.

G. 10, 11 and 12.—Specimens of flax straw from Dutch, Riga and Saharunpore seed respectively.

A few particulars respecting this flax straw are introduced from the proceedings of the Society for March, 1856.

Sixth.—H. 1 and 2.—Specimens of flax straw raised in the Society's garden from Riga and Dutch seed. Pulled in March, 1856.

Extract of a letter from Capt. F. W. RIPLEY, Sandoway, dated September 3rd, 1855.

"Owing to the boat not having left before this with the *A. 1 and A. 2. box of tobacco samples, I have been able to add a small sample of the Yaseng Shaw, also a piece of a creeper,* which you will observe has some very strong fibre in amongst the wood. I have not yet had any prepared, but as soon as it can be done, I will send a sample to you for the museum and trial; it is used for boat-cables, &c., being of great strength, and is called the Gnan creeper."

Extract of a letter from Capt. F. W. RIPLEY, Sandoway, dated December 8th, 1855.

"I send you by this day's dâk viâ Akyab, a small box, with a few samples of fibres."

B. 1. Nan-Shaw, the fibre of the piece of creeper sent up the other day. This appears to be the same as the Nandyong sent last year from Akyab. I have got some young plants in of this, and will send them when I receive back my case.

B. 2. Koong Thenban Shaw.

B 3. Panpeng Shaw. This is the fibre of a small kind of *Hibiscus*, which bears a pink flower; it is the greatest pest in the way of jungle in all the villages of this place, springing up during the rains to the height of four or five, even six feet. The specimens of fibre, both of this and No. 2, are not well cleaned, but this is owing to the bark being too old and dry when the same was cut. Young plants I will send with the Nan Shaw.

B 4. Is a small parcel of the fibre of the Arracan plantain.

B 5. Of Pine-apple fibre.

B 6. Of the Ramtarai or Beyndee.

I have got in sixteen kinds of plantains, but the weather is now too dry to send them up safely, so I must keep them until the beginning of the rains.

Extract of a letter from Capt. F. W. RIPLEY, Sandoway, dated February 5th, 1856.

I send you up by the *Hugh Lindsay* a roll* of sacking
*C 1. made from the Shaw Ne bast in the Akyab jail,—as a specimen for the Society. This sells readily at Akyab at 20 Rs. per 100 bags.

There is I hear a perennial kind of indigo in this island, which is propagated by slips or cuttings. I have sent for some, and will if possible despatch them by next steamer. I see by the proceedings of the last meeting that some cordage, &c.. from Moulmein has been sent up; it is I expect from the Panpeng-Shaw plant, which I spell wrong, calling it Poopeng in my letter to you, please correct it.

Extract of a letter from Capt. RIPLEY, Kyook Phyoo, dated March 7th, 1856.

By this opportunity I send you, to lay before the Society, two mats made from the Shaw Ne.

C. C. No. 1. is I think the best of the two, and is made
• quicker and easier than

C. C. No. 2. The work in this finer and much closer than the specimen of Russia that that you kindly sent me.

In the box I have put three small bags of seed of the plant which yields the fibre called Papeng-Shaw, and which I take to be the kind of *Hibiscus* from which the sackiug, &c., sent from Moulmein was made.

1. Is the red-flowered variety.
2. The yellow.
3. Mixed seed, gathered from both kinds.

This seed I recommend being sown in rather rich soil at the commencement of the rains, and closely scattered to prevent the plants branching, and thus increase the length of the main shoots and fibre. The natives here cut the plant when the bark begins to turn brown, then split the stem with a knife, and the bark easily separates from the wood. It is then soaked in clean water for a day or two, and exposed to dry in the sun, when with a little beating, the fibre is separated from the useless portions of the bark.*

I return with many thanks the sample piece of mat which the Society kindly placed at my use.

I shall be glad to hear the opinion formed of these mats. I cannot as yet give any idea as to what they would cost; the men are new to the work, and it has taken ten men to make No. 1, and fourteen No. 2, but every day will improve this; they were made entirely by hand.

Extract of a letter from J. H. BRIDGMAN, Esq., Newra, Gorruckpore, dated February 26th, 1856.

"I send to-day, by dawkh banghy, a small parcel of the fibrous bark which I mentioned that my neighbour

* "The Papeng-Shaw was raised last year from acclimated seed, and is in about two and a quarter beegahs of land. I have already made two attempts to extract fibres out of this plant, but failed. I have put some more again and expect to be more successful this time. I am gathering as much seed as I can obtain." (*Extract of a letter from Officiating Gardener's note, dated February 17th, 1858.*)

Mr. Peppe had discovered in the jungles. This is not nearly so white as some that I have seen at a former time. I have not seen the tree from which it has been taken, but Mr. Peppe tells me that this substance forms the inner bark, between the wood and the outer bark, and is often to be found of an inch or more in thickness. The tree when cut down throws out shoots in a single season of several feet in length lined with this material. It does not appear to me to have sufficient strength for the purposes of cordage, but might answer very well for paper. I understand from Mr. Peppe, that a year or two ago he sent a large quantity to Messrs. Watson and Co., of Clive Street, and that he believes Mr. Watson sent it to a paper manufacturer in Scotland to experiment upon. It would be very interesting to ascertain what the result has been."

Extract of a letter from W. WATSON, Esq., Calcutta, dated March 7th, 1856, regarding the above fibre.

"This last mail brought us the report on the fibre Mr. Peppe sent us. We sent it in a vessel so soon as we received it, but the vessel was detained in Calcutta a long time on account of accidents; it was shipped in April, and we believe the vessel did not leave till August the Sand Heads. The report of the gentleman who has several factories in Dundee, states it is not well adapted to any of our manufactures. It appears to be the fine rind of some tree like the material of which the Russia mats are made, only much finer. It is too much of a woody nature for dressing and spinning by machinery."

Extract from the Proceedings of the Society for March, 1856, respecting Mr. STALKARTT's three specimens of flax straw.

"No. 1.—From Dutch seed. Stems measuring 4 feet in length, and perfectly free from branches. This seed was received from the Society, and sown in the first week in

December, 1855, with the chemical manure (excepting bone dust,) mentioned in the Secretary's communication on the cultivation and manufacture of flax, published in the Society's *Journal*, Volume IX, p. 64.

No. 2.—From Riga seed. Stems straight, and branches $3\frac{1}{2}$ feet in length. This seed (also received from the Society) was sown about the 12th December, watered several times, and once with nitric acid, a very weak solution, 60 drops in water over 5 square feet; perhaps less would be sufficient.

No. 3.—From Saharunpore seed. Stems also straight, and branchless, 3 feet in length. This seed (likewise received from the Society) was sown in rather dry ground, and watered once to make it germinate, and manured once with a very weak solution of sulphate of potash, about 60 grains in water to about five square feet."

REPORT ON THE FOREGOING SPECIMENS.

Specimens from Arracan.

A 1.—"Yaseng Shaw." Of no possible use as a fibre. It is full of gum, which, if removed, would leave a fibre weak and worthless. In its present state it might be made into a kind of mat.

A 2.—A piece of the bark of the "Nan" creeper, used for boat cables, which shews how rude in their contrivances the Arracan people are; we in Bengal are not reduced to such shifts.

B 1.—Fibre of "Nan Shaw." In its present state quite unfit for being manufactured into any thing, unless Lieut. Ripley can devise some means of getting rid of the gum.

B 2.—"Koang Thenban Shaw." A very poor specimen of jute, not worth in ordinary times the cost of freight and charges to England.

B 3. "Panpeng Shaw." A small kind of *Hibiscus*. A tolerably clean sample of jute. Nos. 3 and 4 and rejections, all made together. Of very little value.

B 4. "Plantain fibre." A poor fibre, very harsh, brittle and weak. Of no appreciable value as an article of export.

B 5. "Pine-apple fibre." A very nicely prepared sample, but as an article of commerce it can never compete with flax.

B 6. Fibre of the "Ramturai." This fibre is stronger than jute, but from having so much of the gum left on it, is very harsh; although it were prepared with the utmost care, it could only be sold in the English market as jute.

C 1. CC 1. CC 2.—Of the value of these specimens I have no idea; but it is no doubt very small.

Specimens from Berhampore.

D 1. and DD 1. The fibre of the "Ramturai" cleaned and uncleaned, a very coarse, towy, weak, and worthless fibre.

D 2 and 3. Specimens of rope made from the above, and from the "Magnaut paut," probably of the same value as similar rope made from jute, if so good.

D 4. Fibre of the *Hibiscus* plant. A very badly prepared specimen of jute.

D 5. Fibre of the Aloe plant. Exceedingly brittle; not so good a fibre as B 4, although of the same class.

Specimen from Gorruckpore.

E. A fibrous bark, evidently of the same description as Lt. Ripley's "Yaseng Shaw" A 1, and certainly of no more value.

Specimen from the Society's Garden.

F. Fibre of *Sida Asiatica*. This and the *Sida rhomboidea* are only adapted for the same uses to which jute is applicable, and would consequently only sell as jute in England.

Specimens raised at Goosree in the vicinity of Calcutta.

G 1. Two samples of unhackled flax from Riga and Dutch seed; steeped 48 hours last week in March. In hackling, flax like this the yield would be very small, probably not a

half of the whole, the remainder being tow. This most likely arises from too long steeping in a high temperature. Value in England say about £22 per ton.

G 2. The above in a hackled state. The fibre is very weak, and is altogether but a poor specimen of flax, being mixed, and a great deal of it very harsh, worth about 3*d.* per lb.

G 3 and 4. Unhackled and hackled flax from Dutch seed, steeped for 36 hours. These are superior to the two previous samples, and may be considered as of very fair quality, though still deficient in strength of fibre; probable value of No. 3 £27 @ £28 per ton, and No. 4 3*rd* @ 4*d* per lb.

G 5. Riga flax, white and green sorts, the former steeped five days, the latter three, at the end of February. The former appears to be over-steeped, and what it has gained in fineness, it has lost in freshness and strength of fibre. Four days' steeping would probably have answered better than either of the above periods. The value of the white may be stated at £27 @ 28 per ton. The green is not at all suitable, being excessively harsh.

G 6. Saharunpore hackled flax steeped three days at end of February. Dull coloured and deficient in strength and freshness of fibre, value say 3*d.* per lb.

G 7. Patna flax, unhackled. A very bad specimen, and the fibre almost rotten. If originally ever worth any thing, it must have been spoiled by over-steeping and in the preparation. If attempted to be hackled it would be nearly all converted into tow. This would be known in the home market as "Dutch Rayne," being worth not more than £10 a ton.

G 8. The above in a hackled state. A very poor sample of flax, and very weak. This cannot be valued at worth more than tow.

G 9. A specimen of flax not steeped, but dried in the sun and crushed. This sample has all its original strength, but is imperfectly prepared from the straw. Had it been

properly steeped, it would have been of excellent quality. In its present condition it is unsuited for the home market.

G 10, 11 and 12. Specimens of flax straw from Dutch, Riga, and Saharunpore seed respectively. All excellent, particularly the first and second, which are very fine. Had the seed been sown in the beginning of November instead of in December, the straw might have been pulled from the beginning to the middle of February, a better time for preparing the fibre than the beginning of March.

Specimens from the Society's Garden.

H 1 and 2. Specimens of flax straw raised in the Society's Garden from Riga and Dutch seed. These are very inferior in every respect to the above three specimens, being comparatively short, thin and branched; the last mentioned defect arising most likely from the seed not having been sown thick enough.

It may be remarked, with regard to all the hacked samples of flax, that the hackling has been very imperfectly performed, and in a way that would not pass muster in England. In other words all the tow has not nearly been hacked out. But this is not after all of much importance, as flax shipped from India would necessarily be unhackled.

CALCUTTA:

W. THOMSON.

March 13th, 1857.

I agree generally in Mr. Thomson's remarks on these specimens of fibres.

March 16th, 1857.

W. HAWORTH.

Note on two samples of Potatoes raised in Tirhoot by J. FINCH, Esq., from acclimated Darjeeling seed.

(Communicated by Joseph Willis, Esq.)

I have now the pleasure and satisfaction of laying before the Agricultural and Horticultural Society, to be exhibited

Note on two samples of Potatoes.

at the next meeting, a paper from Mr. Justin Finch of Shahpore, Oondee, Tirhoot, addressed to myself, with specimens of two potatoes of magnificent growth and appearance, Calcutta, dated February 13th, 1857.

The paper fully and nicely describes the particulars of the cultivation and cropping of the small piece of land employed for three successive years; and with a result of potato and indigo crops in each year, most highly remunerative.

Mr. Justin Finch has informed me that the said piece of land was excellent in itself, in all respects *ab origine*.

CALCUTTA:

February 16th, 1857.

These samples were grown upon the same piece of soil from which crops of potatoes have been raised and gathered for three successive years. They are the produce of the seed potato gathered from the above-mentioned piece of ground last year, *i. e.*, January, 1856; it was put down in the beginning of November, 1856, and the crop has been gathered in January, 1857.

The process of cultivation followed was an abundant manuring with stable manure in September, well ploughed into the soil, then a thick coat of *Indigo seet*, about a foot in thickness, laid over the land, and allowed to remain until very close to the sowing time, when it was well trodden down by cattle, all the sticky parts removed, and the remaining part well ploughed into the ground. This identical piece of land has given within the twelve months one crop of potatoes, and one crop of indigo. The produce from the potatoes was the 1st year 50 maunds, for the second year 40 maunds and for the third year 65 maunds. The extent of this piece of land is six cottas of the Tirhoot beegah (which measures 40,000 square feet.) After the potato crop had been gathered off the land, a crop of indigo was put in, which has always succeeded, and given two cuttings, and afterwards been quite in time to receive the potato crop: the average pro-

duce of these six cottahs of land, have been annually as below :

		mds.		seers.	
1854-55	or 1st year,	50	of potatoes:	12	indigo,
1855-56	2d year,	40	ditto.	12	ditto,
1856-57	3rd year,	65	ditto.	12	expected
		155		36	

Showing a result that this six cottahs of land has given in three years an yield of 155 maunds of potatoes, and 36 seers of indigo. The seed potato was originally from the Darjeeling stock; the quantity usually sown about 4 maunds cut up, and the eyes sown.

The present samples were from the potato sown whole, without being cut.

These samples weighed when taken up respectively 10 chittacks and 9 chittacks each; they were weighed this day by Mr. Joseph Willis, and were found to be 9 chittacks and 8 chittacks each, shewing a loss in weight of a chittack each.

The acclimated seed was not cut up for sowing, it having consisted chiefly of the very smallest potatoes of the crop. In dry seasons the crop was watered three or four times, but in the present (say *past*) moist season, it was only twice watered.

The flavour of the potatoes is unexceptionably fine, and to my taste equal to, if not superior to, the very best quality of potatoes to be had in Calcutta.

CALCUTTA:

February 13th, 1857.

Report on "Tewra" oil from Gorruckpore, and on an aromatic oil from Benares.

To the MEMBERS OF THE OIL AND OIL SEED COMMITTEE.

GENTLEMEN,—I have the pleasure to submit, for the favour of your opinion, a sample of an oil-yielding seed, and a

bottle of oil prepared from it, which have been forwarded by Mr. Peppe, Indigo-planter, Gorruckpore district. You will perceive from Mr. Peppe's letter, which is annexed, that this seed, which is unknown to him, is called by the natives of Gorruckpore, "Tewra." It differs in appearance from the common mustard seed and rape seed; it may prove to be the seed of *Sinapis glauca*. Mr. Peppe has not sent any dried specimens, but a small quantity of seed has been sown in the Society's garden, with the view of ascertaining to what species of *Sinapis* it belongs.*

I take this opportunity to bring to your notice a specimen of a fragrant oil recently received from Dr. A. H. Check, Civil-Surgeon, Benares. Dr. Check remarks (see his letter annexed,) that it is *not* the "grass oil of Nimaaur," (*Andropogon calamus aromaticus*), known also as the "Roosa grass oil," (a specimen of which is circulated for comparison,) but "is more powerful." Dr. Check has also sent, at my suggestion, a specimen of the grass,† yielding this oil; but, not being in flower, Dr. Thomson is unable to name it. Several species of *Andropogon* are aromatic; the well-known *Kuskus* is obtained from *A. muricatum*, and the "lemon grass" from *A. Schænanthus*. Another species, named *A. nardus* is called "Ginger or spice grass;" and a fourth (which is probably identical with Dr. Check's) is called *A. Iwaruncusa*. Dr. Check observes that his grass is called "Hurdwar-i-koosah." Dr. Royle states (*Illustrations Himalayan Botany*) that *A. Iwaruncusa* is a native "of the country skirting the base of the Himalayas. Mr. Blane found it between the Hills and the Rapti; Dr. Boyd near Hurdwar, in which neighbourhood, in the Kheree Pass, and at Mohun, I have also found it." This grass, both in habit and taste, is stated by

* The seeds germinated readily, but the plants withered before attaining maturity.—A. II. B.

† This is also put in the box.—A. II. B.

Dr. Roxburgh to come remarkably near to the "lemon grass."

Yours faithfully,

METCALFE HALL :

A. H. BLECHYNDEN,

March 27th, 1857.

Sec. A. and H. Society.

*Extract of a letter from Mr. PEPPE, of Gorruckpore, dated
November 28th, 1856.*

"I should feel much obliged for your opinion on a sample of oil I am about despatching to your address. It was extracted from a seed called, by the natives here about, "Tewra." I am not certain where the seed came from, but two years ago I saw some plants of it in a field of linseed. The following year the same field was covered with the plant; I then had the seed collected. I observe that the seed left in the ground during the year vegetates in October and ripens in December. It appears to be a very hardy plant, and seeds abundantly. Some of the plants I saw were from five to seven feet in circumference. From five measures of seed I got one of oil. Should it be considered of a good quality, I think it might be grown much cheaper than any of the other oil-seeds. I will despatch in December a maund of the seed, and a seer or two of the oil, which you may dispose of as you think fit."

*Extract of letters from Dr. A. H. CHEEK, Benares, dated
March 1st and 16th, 1857.*

"I have sent you a small bottle of oil, which I have procured from some grass procured in this and the Mirzapore districts, and found in large quantities at the foot of the Hills. About twelve ounces of the oil is obtained from the maund weight of grass. It resembles very much the "grass oil of Nimaur," but is more powerful. It is extremely pungent, transparent, and of a fine green colour. It has a different odour from the "Nimaur grass oil," but is equally

efficacious as a liniment in rheumatism, and also as an internal stimulant. The grass grows to about the height of two feet, and gives forth a strong aromatic smell. This oil was procured from the grass when nearly dry. If taken in October, when the plant is in bloom and fresh, I think a much larger quantity of oil could be extracted. I am not aware of *this* oil ever having been brought *publicly* forward, and I shall be much obliged by the opinion of the Society on it, as I consider it a very valuable oil, both as a stimulating liniment, and embrocation in rheumatism and neuralgic affections, and also as a stomachic stimulant of great efficacy."

"I have this day sent you by dawk Banghy (*paid*) two pieces of the grass from which I extracted the oil I sent you. The natives know *nothing* about this grass, but call it "Hurdwar-i-Koosah." All the Hills near Benares and Mirzapore are covered with it (at the foot of the Hills.) It is doubtless a valuable oil, and if of sufficient importance to introduce into the market, could be much improved on, and be had in *any* quantity required. What I sent you was from a SINGLE distillation."

Report by Baboo Ramgopaul Ghose.—Mr. Peppes' oil-seed is well known by the natives by the name of "*Taurra bechee*." It is found more or less mixed with lin and rape seed. The sample of oil has a disagreeable odour and taste, which if inherent in it, will prevent its use in culinary purposes. I doubt also if it will prove a good lamp oil, for though it gives a fair light, there is much soot emitted from the flame. I am told also that the yield of oil is small, being only about one-fifth of the weight of seed. Bearing this in mind, and looking at the quality of the oil, I should be disposed to value the seed at half the price of good rape seed, or say Co.'s Rs. 1/12 @ 1/14 p bazar maund.

I do not feel myself competent to pronounce an opinion on Dr. Cheek's "grass oil." Its medicinal virtues may make

it very valuable when well known, but it can never rank high as an article of commercial importance.

April 16th, 1857.

Report by Mr. James Cowell.—I concur in the remarks above. As Mr. Peppe has promised to send down a pound of the "Tewra" oil, I would recommend its being sent to Mr. Wilson, of the Belmont candle factory, near Vauxhall, London, and who, I think, promised to give us his practical opinion on any oils we sent him.*

The "grass oil" from Dr. Cheek may have medical properties which can only be put to the test of experience.† It is acrid, has a disagreeable smell, which will unfit it for any culinary uses, but it may prove to be of utility for other purposes.

April 17th, 1857.

Report by Mr. C. B. Wood.—The "Tewra" oil sent by Mr. Peppe would, I think, make a fair lamp oil, if carefully prepared and refined; it is perhaps better adapted for machinery. It is like rape oil, which I believe is considered better suited for lubricating purposes than any other seed-oil. The "Tewra" is said to yield only 20 per cent. oil, but if the seed could be procured at half the price of good rape seed, I think it would answer.

The essential oil from Dr. Cheek is similar to the "Roosa or grass oil," common in the S. and N. Territories, where it is used by the natives as an embrocation in "rheumatism."

April 18th, 1857.

Supplementary report by Mr. Wood.—The "Tewra" oil received from Mr. Peppe, and which I refined as per sample,

* Mr. Peppe was requested to send down a few gallons of the oil for this purpose, but the disturbed state of the country has probably prevented his doing so.—Eds.

† Dr. Cheek was requested to oblige the Society with a larger specimen, for transmission to the Pharmaceutical Society; but he has not been able, as yet, to send it down.—Eds.

burns very well in a small lamp ; there is not enough to try on a larger scale.

In its present state the oil has a jungly disagreeable smell ; this could be got rid of here as well as by refiners in England. I would however send forward the sample without any reference to its burning qualities, for I could not try my moderator lamp without two quarts of the oil.

February 18th, 1858.

Dr. J. B. Barry was also kind enough, (though not a Member of the Committee,) to report on the "grass oil" to the following effect :—

"The specimen of "grass oil" you submitted for examination some days since is very inferior. The aroma is very heavy and unpleasant ; which detracts from its value in a medicinal point of view, as such oils are only used to give a pleasant smell to liniment and embrocations ; it has not the slightest resemblance to the "grass oil" of Ceylon, and never could take its place in the market."

CALCUTTA :

May 13th, 1857.

A few additional remarks on experiments with Silk-worms, with a view to improve the present silk-yielding species of Bengal, by engrafting on them the very superior properties of the best French and Italian races, but without altering the rapid succession of generations of the Indian insect : By F. BASHFORD, Esq.

My last communication (*Journal*, Vol. IX., p. 259,) carried my experiments with silk-worms over a period of near three years, down to August in our rainy season of 1856. The few worms I then had feeding were very sickly, however we had fine weather afterwards, and they improved so much as to give a crop of very fair cocoons, from which I had a good supply of eggs, and all hatched on the tenth day, and as we had continued fine weather, and plenty of food,

the worms grew famously, and produced a crop of very fine cocoons, the report of which spread through the district; and the applicants for seed were far more numerous than I could satisfy; a great many were supplied, and had very fair success with the worms. The whole native crop of the neighbourhood was more or less diseased, but not one of the cross-worms was attacked, the natives had confined them to too small a space, and stinted them in food, but still the cocoons were a vast improvement upon the indigenous worms, and I had the satisfaction of reeling some six bales of silk from them of a very superior quality; a large quantity was also sold for seed, and spread far over the district; however, I am sorry to say, that the crop this time was a great failure, the worms deteriorated, from being treated as natives rear their country species, became reduced in size and strength considerably, and the cocoons were light, flimsy, and a perfect disappointment. The natives discarded the breed at once, and I gave it up also, but I still retain the annual or irregular hatching eggs, and have now and then, as fine cocoons nearly from them as you see in Europe, from the pure worm, quite as good I think, but those crossed with the Bengal male not so good. The result of my experiments brings me to conclude that the worms of this country will not bear a permanent and beneficial cross with Europe stock, unless treated as the worms are in Europe, viz., well fed, and carefully kept in capacious and clean well-ventilated houses, with an even and moderate temperature. As we cannot expect this care and attention from the natives, I despair of seeing any improvement of our Bengal silk-producing worms by any cross with a strange species.

The Europe worm could be reared here as an annual, if we understood the artificial means adopted for making the eggs hatch all at once at any given time; at present they produce so irregularly, as to be quite unsuited for profitable rearing.

A few remarks on experiments with Silk-worms,

*Suggestions on reading Mr. Bashford's experiments with Silk-worms in Bengal.**

The silk-worm appears to have been greatly improved in its capability of producing silk, both in quality and quantity by modes of treatment adopted in some countries, and to have been injured in both respects in other countries by injudicious management.

The eggs may be hatched by artificial heat at any time of the year, but ought to be retarded by being kept in dark and cold places, until the mulberry is in leaf, for, as that is its natural food, clearly meant by Providence as such, (for no other insect will eat the leaf) the mulberry leaf should be grown before the insect is ready to feed upon it.

The silk-worms require great regularity of temperature, exposure to cold just before the time of spinning destroys their power of doing so, by congealing their gum. If the cold be severe, the gum becomes solid in the body of the worm, and it dies without spinning or passing into the chrysalis state, but a less degree of cold produces an inferior and flossy silk of uneven thread. For these reasons, rearing houses should be constructed, so as to equalize the temperature, which is easily done by the modern improvements in ventilation, flues, and heated air, or water-pipes led round the rooms.

Whether the Indian worms are distinct in species from the annual worms of Europe and China, or whether the difference of nature has been caused by influence of climate and treatment, are matters of less moment, than to know how to act by them as they are, so as to obtain the utmost possible in quantity and quality of silk.

Now it is evident that the Indian is a more ephemeral creature than the annual, as such a strength of constitution and

* "I send you copy of a letter sent me from England on reading my previous paper, which you may wish to print in the *Journal*."—(*Extract of a letter from Mr. Bashford, dated January 19th, 1858.*)

power of production, equal to the annual, cannot be possible; but its powers might be developed beyond what they now are, were they treated according to their natural instincts, as the annual worms are in China and Europe. The silk-worm is a creature of the bush, which light and pure air surrounds, but when immured in darkness, and the foul air of an un-ventilated building, its instincts and functions must suffer. But in Bengal, they are kept in foul dark dungeons, lest flies should destroy them, whereas wire gauze, or any cloth of open texture, for windows, would keep the flies out, and let light and pure air in, and better still, glass windows with lattice blinds, and for ventilation long pipes or boxes of a large size, say a foot diameter, and thirty feet long, led round the sides of the room, through which dark passages the flies would not enter, and similar boxes of pipes on the ceiling would carry out the foul heated air. The worms want light, equal warmth, pure air, room, and cleanliness, and also fresh gathered leaves, for they heat and ferment if kept in heaps, and so become rank and stimulating, and also, if wet, cause contagious and fatal diseases.

By thus restoring the creature to its natural condition, would be the first step toward giving it a better constitution than it has at present, but if that be sought by breeding in with the more healthy and hardy worm from Europe, the improvement sought would be short lived, seeing the European blood would be at once subjected to the weakening influence of the Indian modes of treatment, and degeneration would follow.

Again, if annual and monthly worms are distinct species, to amalgamate them in one is impossible, for the stronger stamina will prevail, still a small portion of annual blood might act beneficially, if the native stock be also improved by the treatment already alluded to.

So also, the worm from Europe (like men and animals) requires to be acclimatized, for which end the stock from

Europe should be kept pure, a small portion being retained wholly breeding within themselves, but from which, from time to time, crosses with the Indian worm should be made, from which crosses the breed obtained from the previous crosses should be strengthened. Thus the first cross paired with the Indian, that with the Indian again, and so twice more, would reduce the European blood to a fifth degree, or 32nd part, then if that stock were left to breed wholly within itself four or five generations more, the proportion of Indian and European blood, so to speak, would remain the same. Now would be the time for another cross, not with the pure European stock, but with another cross obtained from it as was the first, and kept distinct till this occasion. So the European blood by this means would not predominate, and a tendency to recur to the nature of annuals result, as hitherto appears the condition of the hasty crosses tried at Surdah in Bengal. In every case of breeding for stock select the strongest and healthiest moths, and from their eggs, the first lay only, say the first 50 or 100, for it is not natural that a moth parting with its substance or body, *i. e.*, its health and life, in so vast a number of eggs, should be other than enfeebled towards the end of her laying. The first eggs are likely to have the vigour of both male and female.

The Gardener's Note Book,—No. 2.

On the cultivation of the Dahlia in and around Calcutta: By the late Mr. JOHN McMURRAY, Head-Gardener of the Society.

The cultivation of the Dahlia plant in and around Calcutta is carried out in two ways; the one in the open ground and the other in pots, placed in the most favourable aspect for the plants and decoration to the garden. Under both methods the plants thrive and flower, but more so in the pots, though

only for a short time, which arises from the care and attention bestowed on the choice of soil, and the advantage of a free-drainage, which the pot system affords to the bulbs, being raised above the level of the ground, which becomes saturated with water by the beginning or middle of August, which materially injures the tubers, when planted out in the ordinary open ground mode practised about Calcutta, without any preparation previously being made. But if the same attention was paid to the ground cultivation, as that bestowed on the pot system, the case would be materially in favour of the former, as the *Dahlia* is well known to be a perennial tuberous rooted plant, and may be continued or started into a second growth in the course of one year when the weather is favourable for that purpose, as is the case in this country during the rainy and cold seasons, when the bulbs are planted out in the open ground. For this purpose the beds which are intended for growing them in should be raised above the level of the adjoining ground two feet and a half; in order that no unnecessary water may lodge about their roots; the bulbs should be started in pots, as directed below, and the plants should be set out so as to slope upwards from all sides of the beds, as a great portion of the effect they produce depends upon their arrangement, both as regards size and colour.

The operation of potting should commence about the first of June, if the weather is not extremely hot and unfavourable; but it should not on any account be deferred later than the middle of the month. The pots chosen in the first instance should be of a small size, and half filled with compost, having previously had a good drainage placed over the hole in the centre of the bottom. After potting, the bulbs may be placed in a North aspect, out of the mid-day sun, until they begin to break or push out buds, when they should be shifted into a more open and exposed situation; and so soon as the tubers have made a stiff healthy growth of from six to nine inches in height, they should then be shifted into the open ground or

On the cultivation of the Dahlia

flowering pot, which on this occasion ought not to be less than from fifteen to twenty inches deep, and proportionately wide at the mouth.

The compost to be used for the first potting should be of a light, open, and sandy nature, without any manure, as the object then is to encourage the growth and formation of roots, but at the time of the second shifting or potting, there should be a liberal supply of well decomposed cow manure mixed with the compost, which at all times should be light, free and open, and the pots well drained to ensure a healthy growth of the plant.

At the time of the first potting, the crowns of the tubers should not be inserted underneath the soil more than half an inch, otherwise the bulbs are liable to damp off; water at the same time should be sparingly given, or it will cause the same effect, until the tubers commence to grow, after which a liberal supply is requisite to encourage a vigorous healthy growth. Liquid manure should occasionally be substituted, to throw colour and vigour into the plants. When the shoots have grown from ten to twelve inches high, it will be necessary to support them with sticks, forced into the earth in the centre of the pot, to which the shoots are to be loosely tied with small pieces of string. The sticks should be sufficiently strong, deep and firm in the soil, not be shaken loose by the wind, and they should be from three to six feet or more long, regularly tapering a little from the bottom to the top, and the thick end should be sharpened to a point, and that end inserted close to the shoot of the plants in the soil, bearing in mind to put down the long stakes to the tall plants, and *vice versa*.

As the shoots continue to advance in height, the tying, as mentioned above, should be also continued at intervals of about every six or eight inches of new growth. To do this, it is proper to look over and examine the plants every five or six days, as the stems are very brittle, and liable to be

in and around Calcutta.

broken by the weight of the leaves and the wind, if not supported in this manner.

The Dahlia plant is subject to the ravages of insects throughout its whole stage of growth, but more so when the leaves are in a young and tender state. At that time, they invariably attack the young or folded leaves of the shoots, and conceal themselves in the centre of the bud, so that it is no easy matter to see them until a great deal of destruction has been done, and not unfrequently the bud being entirely destroyed. The grub should be effectually destroyed in its young state, and the surest way of doing that is to pick off all that may be visible, and then squeeze the young foliage gently between the finger and thumb, as the insect is very small, and may escape observation.

The rainy season growth of the Dahlia plant suffers materially at the end of the rains, and frequently die down altogether from the sudden change which takes place in the weather at that time, which might be remedied through the cultivators paying more attention to the natural habit of the plant, and remembering that the Dahlia is a perennial tuberous rooted plant, which may be rallied again, though it may have grown and flowered abundantly during one season. Why it should not be managed to do the same again, when the weather is equally as favourable, if not more so during the cold weather, is astonishing to me, as it has been shown on a small scale to be perfectly within the accomplishment of most cultivators, who give but slight attention to the subject. The Dahlia plant, as above stated, springs from a perennial tuberous root, the stems of which are very succulent, and consequently liable to be damaged or totally destroyed by any sudden change which may take place in the weather, and which in most cases cannot be guarded against, but a second young growth may be encouraged, which will flower freely during the cold weather, by thinning out the tall, straggling, and useless branches, and only

leaving such of the young and tender growth near the ground as are likely to start into a fresh and vigorous growth. The pruning for this purpose should be commenced in September, so as to gradually harden the young growth; for the sudden change which may always be looked for in October, at which time the roots of the plants should be partially stripped, and a fresh rich compost substituted in place of that removed, and immediately afterwards watered, to settle the earth about the roots, after which the plants at all times should be managed the same as that stated above during its first growth, save that they should be artificially watered at intervals as may be deemed necessary.

By the middle of February, or soon after, the greater part of the plants will begin to appear brown and dry; vegetation has then ceased, and it is then the exact time to take up the tubers, because if they are suffered to remain in the ground till the spring showers ensue, they will begin to shoot afresh, and thereby sustain considerable injury. Before the tubers are taken up, their stems should be cut off close to the ground, the bulbs should then be lifted and placed in a dry airy godown, to dry gradually, but before this is perfectly accomplished, it will be proper to clean them, by rubbing off the soil which may adhere between the tubers. Nothing more remains to be done till the return of the potting season in June, except to see that the different kinds have been carefully named, with the colour of the flower each kind may produce, height and dimensions each plant may attain, the whole of which is requisite as a guide for the following season. As regards propagation, the tubers should be divided at the time of the first potting, and cuttings may be struck when sufficiently ripe during the whole stage of growth, care being taken not to place them under a damp bell-glass, otherwise they are sure to damp off.

CALCUTTA:

August 11th, 1857.

*On the culture of English vegetables in the environs of
Calcutta: By Capt. H. B. WESTON.*

Having finished all my correspondence, I sit down to fulfil my promise, and, according to your request, give you my ideas on the culture of English vegetables in the environs of Calcutta.

On commencing from a new piece of ground, I should first examine and see the different sorts of grass that the turf was composed of, none of which I consider troublesome to get rid of but that called the "mootah" [*Cyperus rotundus*] and the "cassiah" [*Saccharum spontaneum*]. The "mootah" I think the worst, on account of the net-work it forms, and the rapid increase of its nuts or tubers, which also increase from each other, and prevent a free course for the roots of vegetables, bind the earth, and take away the chief strength of the ground.

In breaking up a new piece of ground, I think it advisable to do it two feet deep, as that will destroy all the annual weeds and grass; but if the "mootah" exists in a great degree, it is as well not to do it deeper than eighteen inches, the first year, as by digging it two feet you would place a great many of the nuts at that depth, to be dug down for afterwards, and the labour of removing them would be much greater than going down eighteen inches, and the great object is to remove this most obnoxious weed.

I dig a trench the depth I intend to break the earth up to, removing the material outside the ground I am digging up. I then take off the turf next to the trench, and lay the grass down inside it, and digging up the earth to the same depth as the trench, throw it all on the turf deposited at its bottom. This leaves another trench, into which the next turf and earth should be thrown, and the same thing carried out through the whole piece of ground intended to be brought into cultivation, and the trench left filled up in the same manner by the turf

and earth dug out of the first trench, which will level the whole ground as it was before it was commenced on.

The men while digging up the earth should take every bit of "cassiah," and of "mootah" nut (they see) out, and put it into a basket. Where "cassiah" is found, it should be removed three feet deep, which I think will destroy it. I have succeeded in doing it by these means or method.

The same year, and continuously till these two grasses are eradicated, whenever they shew themselves, the earth should be carefully removed round them, and the thread followed, till, in case of "mootah," the nut and any others that shoot from it be found and removed, and the "cassiah" to three feet deep. When the work is over for the day, the earth should be beaten off the roots, taken up, and left in the garden, the roots piled up in a separate place away from the garden, and, when a great number are collected, burnt with any other weeds that may have been collected that have flowered before being removed from the ground. Those that have not flowered should be put in the mould pit, as there is no chance of their generating fresh weeds, but when a weed has once flowered, it should be burnt, to prevent the possibility of its generating others; this may appear a very expensive way of going to work, but it will prove the cheapest in the end.

As it is impossible to get every piece of ground under any circumstances to bear a good crop of vegetables while hampered with weeds taking half of the strength of the ground, I deem it a matter of the first importance to remove those that exist, and prevent the new growth of them; it is therefore necessary that every one should be removed as soon as possible, and that none should be allowed to seed either in or near the garden, for each plant will produce its thousands, and of course so much more men and labour will be required to keep the ground clear, and valuable time for sowing or planting be lost also.

I have prevented an enormous increase of weeds merely by carrying a spud in my hand, when I take my rounds in the garden or compound, and, as I passed them, cut them up. This simple instrument and companion used in this way, will do the work of one *mali* in the course of the year, and it is very handy to dig into and see if the soil is in proper order in every way, and it is of little use a person's walking round his garden without it. The "mootah" or "cassiah" however cannot be destroyed in this way.

I look on weeds, red and white ants, and bad *malis*, the most inveterate enemies the gardener has to contend with in Bengal. The white ants are, I believe, easily got rid of by using pig manure; (this is not on my own trial, for I have never been annoyed by white ants, but I firmly believe it, having received the information from a source I can rely upon,) but care must be taken not to use too much of it, as, on account of its strength, it might be the means of destroying or burning some of the roots of the vegetable.

The usual way of getting rid of the red ant is, I believe, by powdered turmeric or *huldee*. I however found a plan my *mali* had, last year, more successful. When the seeds were sown, a coconut with the kernel in it was cut in halves, and laid near the seeds, the ants flocked to it, and when it was full of them, it was immersed in hot water. The nuts were watched during the day, and in three days no more made their appearance. A few days after they made their appearance again, when they were treated in the same way, and again similarly disposed of. My plan, when I find a nest of red ants in the road, or any part of the compound, is to bund the spot round with clay, and pour in boiling water, and I have found it most efficient in the destruction of the red ants. My house was full of them when I came to it, but there are very few of them now.

There is another great enemy the gentleman gardener has in India—his *mali*, who prefers sticking to the old routine

in preference to any thing you may wish to teach him. His caste also is frequently in the way. He seems to delight in keeping weeds till they seed, or doing any thing else that may cause the necessity of employing extra hands, that, if possible, he may make something out of them.

I have always tried to instil into my *mali's* mind that the first thing he has to learn is to destroy the weeds, and, until he does it, he can never be a good *mali* or have a good garden. I have been partly successful you know by what you have seen in my garden. The only way in which I have succeeded is by always sending for him (as I see a weed,) when he is smoking his *hookah*, or doing any thing he may take a delight in, to pull the weeds up, never losing an opportunity of doing so till he gets annoyed with the weeds himself.

I think the best time for breaking up a piece of ground is the latter part of the rains, while the turf is soft, and only sufficient moisture in the ground to rot the turf, and not sufficient water to ooze out and stand in the ground, so that the men are obliged to stand in water.

After digging the upper part, it should be let alone until it becomes partly dry, but not sufficiently so as to cake. Dust lime, or chunam, should be sown on it thinly, and a good quantity of bone charcoal dust. The former, both assists in pulverising and gives strength to the ground; the latter, I believe, only assists in pulverising or loosening it. I have used both of them successfully. Wood ashes are especially good for peas, and fine cinders for any part of the garden, and particularly for asparagus. The chief object in working Indian soil, is, I think, to keep it so loose that it cannot cake, as an earth that becomes so will retain least moisture, and the looser and moister the soil of a kitchen garden, the better.

I think the best crop to put in the ground first, is potatoes, which should be grown the same as in England. The drills should be opened out eighteen inches apart, and about six

or seven inches below the surface level, three inches of good stable manure put in, then, about one and a half inches of earth thrown on it. The potatoes put in, and covered three inches, which will make the ground level, and if planted in October or the earliest part of November, they will require no watering. I think, however, that should there be no rain in November or December, that they should be watered once, so as thoroughly to saturate the ground, which should be hoed the next day, to prevent its binding. They require nothing more after this than hoeing the earth up to them.

I tried an experiment one year with six rows of potatoes. Two I gave a large quantity of water to, two I gave half the quantity, and two none at all. When dug up, those that had had no water were best both in size and flavour, those that had the most water were the worst.

I am of opinion that the ground should always be dug up two feet *deep* for carrots, parsnip, beet, knole-kole; for all other vegetables twelve to fifteen inches. In turning up the ground a layer of manure should be put in at the bottom, and the earth thrown on it. As soon as the earth begins to dry, it should be broken fine till a good season is obtained, and the top frequently moved, to keep it till made use of. After every rain it should be fresh hoed, seed should not be sown until a good season has been obtained, and the day after, and, in case of rain, it is advisable to cover the seed with mats, to prevent its being washed up or caking the ground.

The time for sowing must be decided by the party himself and the state of the weather, but it should be as early after the rains have ceased as possible, and a good season to the ground has been obtained, much of the seed sown before will rot. Peas should not be sown till the rains are *positively* over.

I consider the native principle of raising a bed, and covering it with *hooglah*, the best for sowing such seeds, the plants of which are intended for planting out, and it can be done

earlier than in the ground. Sowing in these beds should be commenced in September.

Asparagus.—I have always sown in pots, and find it comes up best in October or November, being shaded at least half the day. When ready for transplanting, or planting out, holes should be dug from two and a half to three feet apart, and at least a foot deep; they should be filled with six or eight inches of stable manure, and ashes or fine cinders mixed and slightly pressed down, with a little earth put on it; the plant should then be put in, and kept well watered, the ground between them kept hoed loose, to prevent its drying up.

Artichokes.—Of these I can say nothing, for I have never succeeded in getting them to fruit.

Beet.—The best way of growing these, is by digging small trenches one foot apart and fifteen inches deep, fill in nine inches of stable manure and earth mixed, half and half; then fill in with earth four inches, and level the ground; make small drills about one and a half to two inches deep, put seed in a foot apart one by one, and leaving it open for the dew at night, cover in the earth in the morning. If any beet fails, the drills will do for transplanting leeks into. The seed should not be watered till three or four days after it has been sown, and not then if any of the seed is up. After they have come up, they should not be watered unless the plants droop, but the earth kept loose by hoeing between the rows. Beet may be sown in pots or beds, and transplanted with good effect. When young the ground however should be well manured, but it will not succeed so well as rows.

Beans of different sorts.—These should be sown in rows, about eighteen inches or two feet apart, but not till a good season has been obtained. They will come up well and quickly if the seed is good, (I have not succeeded with scarlett runners.) They should not be watered till after a fortnight. Sow in

October, the soil must be kept loose by hoeing between the rows, to prevent the ground drying, and trouble of watering much. So long as the ground is moist two inches below the surface, I do not consider they require any water. The rows should be North and South, as they grow better that way than when planted East and West. Peas and celery should also be sown North and South. When the Broad or Windsor Bean shews six or eight flowers, the extreme bud of the head should be cut off with a pen-knife from the opposite side to the flower. This is to prevent the plant from growing too much, and to send the strength of the plant into the pod. They will send up fresh stems when the first are done with, which should then be cut off. I have had these beans on my table the last five years. All beans should have the earth hoed up to them to about three inches high.

Cabbage, Cauliflower and Broccoli.—Should be sown in the nursery bed when the third leaf makes its appearance or has formed, (if they are not too thick, if so, it should be done before); they should be transplanted to another part of it, two to three inches apart, close up to the leaves, and there remain till ready to plant out in the ground. If they grow long, instead of the trouble of transplanting again, fill in with leaf mould up to the leaves, and so support them till ready to plant. As soon as the plants are large enough, I hoe out drills about eight inches deep, dig a small hole large enough for the hand to go in, fill it with half mould, half manure mixed. Fowls or pigeon manure is the best, but must be used in small quantities, or it will burn up the plant. I then fill the hole up with mould about three inches, in which I plant the young plants eighteen inches apart. The reason of my planting them so close, is that when nearly full grown they shade the whole of the ground, and prevent the sun from drying it up. The first three days they should be moderately watered (less every day) in the evening, and kept covered during the day with a pot or *cutchoo* leaf, which dries gradually, and on

the fourth is no longer of use or required ; watering should be continued sparingly, the plant may be left to the weather afterwards, and only watered when they droop for want of it, but less every time, this is to encourage the plant to root deep, instead of its depending on a supply of water artificially. The ground between the plant should be hoed up to the lower leaf the day after watering, and the ground kept loose, and by hoeing earth up to the lower leaf, fresh roots will form and absorb the nourishment from the fresh manure, which should be put in every time. Before hoeing up, the watering should be decreased, till it comes to once in seven days, the ground always being kept loose to retain the moisture. The watering these plants too much I consider an evil, for though you may get them larger, they will not have so good a flavour. Cauliflower will also be late by not being much watered.

When cabbages, cauliflowers, &c., are planted out in the garden, brandy or white claret bottles should be hung up on sticks in squares of about fifteen feet apart each. They prevent the appearance of the caterpillar on them. A field of cabbages opposite my garden had men all day picking them out, and my garden had not one in it.

Chives.—An invaluable vegetable in an Indian garden, should be grown the same as leeks.

Carrots.—These may be some of the earliest vegetable seeds sown, as well as turnips, parsnips, leeks, onions, and beet. I do not think they would be profitably grown in the seed-bed or pots, although they might ; for, if taken up with care, they transplant very well, but it must be done when they are young, and care must be taken not to break the tap root ; if it is broken, they will grow stumpy. When sown in the ground, a very fine season should be obtained first ; if the ground dries much before they come up, they should be watered at even. A white cloth laid over them for three days or four, after sowing, will much facilitate their coming up, as well as cause more of them to germinate. This plan may

be used also most successfully with onions, leeks, parsnips, parsley, indeed all Europe vegetables, the sun in the day being too strong for many that have germinated to come up before they have taken root, they are consequently parched up. After they are up, they should be watered, to bring the stragglers up. Carrots, to be grown to perfection, should not be nearer each other than six inches at the least, and they should be thinned out to this, leaving the finest ones; afterwards they should be watered as little as possible, but great care should be taken to keep the earth as loose as possible, and as far down as practicable, to allow the carrot to fill out. They will always go down for water, if they do not get it artificially. Carrots should not be scraped before cooking, as it takes away the best of the flavour and colour, they should be scrubbed clean with a brush.

Celery.—I have only been very successful in this for two years, 1855 and 1856. The seed should be sown under cover, and as early as possible, and only allowed about three hours of sun till they are well up, and then not more than half the day. When ready for planting, trenches should be dug at *least* two feet and a half deep, one foot wide at the bottom, and one and a half foot at top. At *least* six inches of solid stable manure should be put into the bottom of the trench, on that about two inches of leaf mould. They should be planted North and South, and not less than one foot apart. Kept well watered, the earth loose, and, as the earth is filled in, care should be taken that none goes between the leaves, as it will surely rot the plant. I have tried the native plan of the noll, but cannot say I like it.

I tried a plan late last year, of putting a split bamboo at the bottom of the trench, and putting the manure on it. It was too late, only being done at the end of January. The celery was very good, but small. I tried it again this year, but fear the *mali* has not put enough manure. In this plan water is only to be given by a noll at the end of the

bamboo, and the earth filled in dry or moist with dew in morning.

Endive.—Should be treated the same as lettuce in every way, excepting that it ought to be tied up, when the leaves are five inches long, and new ties should be put on as the plant grows, slacking each former one off as you put the upper one on, to allow the plant to expand; however I have had but little experience with this, and never succeeded so well as in this year by this plan, which I had not adopted before.

Fennel.—Grows wild in the garden when once introduced.

Knole Kole.—I have been in the custom of growing this vegetable the same way as I have cabbage, but from what I experienced this year in the large one you saw, I shall for the future plant them on a level with the surface, and give them as little water as possible, so that they do not droop, keeping the earth well loose about them continually; of course the hole in which they are planted should be well manured, being filled up before planting.

Lettuce.—Should be sown in the seed-bed, and in a light leaf-mould soil, and allowed but *very little* sun, watered moderately, and, when large enough, planted out not more than ten inches apart, or perhaps eight. When they grow to their size, they will not only keep the earth cool, and moist, but will commence turning each other into head. They should be allowed to spread well before tying up, and it should be tied higher as it grows, and only one band kept on, so that it may fill out well, and form a nice white heart, and large as well as solid.

Leeks.—Should be sown in a fine light leafy mould soil (well watered first) in the evening, and the seed raked in in the morning, and covered with a white cloth during the day for a week after being sown, unless several come up. In that case, the cloth had better be done away with, and copious watering used, which should be continued till all are up, which will perhaps take two months, the earth being kept

loose. When ready to plant out, a small trench nine inches deep should be dug, filled in with six inches of manure, and filled up with mould; plant them in this with a dibble. (Indeed, during planting, the *neerinee* or native weeding tool should be locked up, and only the dibble allowed to be used; the earth can be pressed much better against the root by the dibble.)

Leeks require plenty of water, and so do onions, and they like liquid manure. The earth should be kept loose, and, as the bulbs form, they should be hoed up.

Marjoram.—Should be sown in pots, in a shady position, it is also increased freely by cuttings, as well as thyme. The seedlings should be transplanted into leaf-mould when they commence branching out. It will survive the rains in pots, but they should be well drained, and I think they are longer lived and thrive better for being kept mostly under cover during the rainy season.

Onions.—Treatment for these is the same as for Leeks, but they do not require so much earthing up.

Parsley.—This I sow as soon after the October gale as I can get a good season on the ground, watering the ground well first, sowing in the evening, and raking in in the morning, and covering it for the first three or four days, or till it comes up well. I transplant it as necessary afterwards, about eight inches apart, in squares. It can be raised in pots in the shade very well, and for choice sorts I think it preferable; the ground should be kept loose; it likes water, if the ground is loosened afterwards.

Parsnips.—Should be sown in a shady place; where they cannot get the sun for more than three or four hours a day, and that in the morning; they should be thinned out to not less than a foot apart. Those taken up should be taken as young and as deep as possible, to prevent breaking the tap root. They should have no water after they are all up, but the ground be kept as loose as possible at top, and as far down

as can be managed, to allow the root to expand to its utmost. A sandy rich soil suits parsnips best.

Potato Seed.—I have this year raised potatoes from the seed received from the Society, but they were so small when I left I can say nothing more about them. I have also sown them in the ground, and succeeded in getting some of them up. I should much like to have watched them.

Peas.—Supposing of course that the ground has been prepared and manured, as stated in the former part of my letter, before I sow them, I will first of all get the ground well loosened, and as small as possible. I will then hoe in about four inches wide and half an inch thick of wood-ashes where I intend to sow, which should be saved from the cook room for this purpose. I will then water the ground in the afternoon, hoe it up fine by the evening, and open small drills two feet wide between the rows, and eighteen inches between the two rows. They should be from two to two and a half inches deep. Sow the peas about three-quarters of an inch apart promiscuously, leave them till the morning, and cover them with the earth taken out of the drills (N. B.—Have no pigeons near your garden, or they will take them all up.) Should the peas come up in three or four days, *good*, if not, water them gently for one or two evenings, when, if the seed is good, they will come up. After they *are* up, cease watering altogether, but keep the earth loose on each side of them, to preserve the moisture already in the ground, and allow it to absorb that part of the air which they require, as well as much of the dew as is necessary. When they are too high or tall to support themselves, they should have the earth hoed up to them on both sides. In the morning hoe them up so high as you can, till the earth between them is about three or four inches below that of the peas. The earth between them must be kept loose and peas sticked when the earth will support them no longer.

Radishes.—I do not think these can be grown really good if sown before the commencement of November. I have tried them frequently, both in pot and seed-bed, but always found them tough and hot. Like all other Europe vegetables they require a good season, and the earth kept loose, and moderate watering daily. The turnip species transplant very well if taken up young; and, if properly looked after, give much finer radishes than the seed-bed, being larger, milder, and more crisp. Another advantage is, that you can command a regular supply, by transplanting at different periods. They require water equal to an English summer. Wood-ashes and gravel improve a radish bed very much.

Spinage.—I have not found English spinage easy to raise, it may however be raised from seed, by covering it with a cloth, the same as other vegetables, I have mentioned,—indeed almost all English seed generates better and quicker by this method; the heat of the sun in this country is too powerful, I imagine; for the germ after it is started, before it takes root and shoots into leaf.

Tomatos.—Sown in a pot of light rich soil comes up very well, are very hardy, and planted in the outer edge of the garden will thrive, yield very well, and take up no room; between them I also plant chillies and brinjal.

Turnips.—May be sown in pots, or the ground, or seed-bed; in the latter and pots for first crop, for transplanting, as soon as the weather is favourable, after the rains are over. If they grow too fast, keep them back by spare watering. To keep them back, they are better for being transplanted, and you can command a succession by planting out at different times. They should only be watered sufficiently to keep them from drooping, but the earth must be kept nice and loose.

Yam.—Is best grown, I believe, from the trials I have made, in the following way. Dig a trench about twenty-two inches wide and two and a half feet to three feet deep, fill in on each side with six inches of manure six inches wide, and

the centre eight inches with leaves. After the manure is in fill up* with earth on the side, and leaves in the centre, stamping them down; when level with the surface, cover up with the earth that has been dug out of the trench till all has been disposed of. When the seeds or tubers shoot, plant them in the centre of this ridge, the shoot not more than one and a half inches deep, and from one and a half to two feet apart. Place some stout stumps eight feet out of ground, two feet into the solid ground outside the trench (not in it), cross them with three or four slips of bamboo, to these you may guide two or three rows, by placing *goran* sticks in the ground close to the shoot, the other end against the posts, there will be lots of seed then on the plant, as well as tubers round the main root also, nothing else is required, but to loosen the earth now and then between them; give them no water. When the leaves all die away cut off the stem, and dig up the root; put the seeds and tubers in a box after drying, and keep them in a dry place, when the time for planting has come, they will throw out a small shoot.

The manures used in India by the natives, are, I believe, few; cow manure and *cullie* or oil-cake; the latter I abominate as an impoverisher of the ground. The manure best adapted to the soil of the country is rotten stable manure. Fowl, pigeon and rotted pig's manure, ashes, loam and leaf-mould; peat is good for one year, but it impoverishes the ground for the next. The best way for procuring stable manure well rotted, is to dig a pit sufficiently large enough to hold what you have or can procure, and six feet deep; in the rains it will fill with water, which will completely rot it by the time it is required. When required to be used, dig down on one side, and take out such as is rotten, leaving that which is not to remain for next year. By this means you may make the best piece of ground out of the worst. I think

it would be advantageous to the A. and H. Society if they would have a pit of this sort, and get the residents in Garden Reach, that do not save their stable manure, to put it in this pit.

The soil of this part of India, as far as I can judge, is far from being a rich one, hence the necessity of flooding it, to procure large vegetables, and manuring with *culley*, which is of no good after the first year. I think pig's manure is first, fowl or pigeon second, stable third, cow fourth, lime fifth, and ashes sixth. All of these tend to enrich and lighten the ground. The fifth and sixth, in addition, destroy insects that are injurious to the plant, such as grubs, caterpillars, and grasshoppers, called by the natives *phoring*, which cut off young cabbage, cauliflowers, peas and potatoes very annoyingly; tank mud is of use only for one year.

The soil here is very apt to form a hard crust, which renders it difficult to work, or for seeds to break through. Lime ashes, fine cinders, and bone charcoal dust, are capital things to do away with this evil.

The watering of vegetables, and indeed all other plants, is, I consider a great evil, and an error done to obviate manuring. They make a ridge round their beds of hard mud, and flood them; doubtless they get large vegetables that way, but do they have a good flavour or are they mostly without it.

My principle, be it good or bad, is (with the exception of cabbages and cauliflowers,) to make all my beds round, and about eight to ten feet wide, the space between the beds (about six inches) is a walk for the *mali*, to use when hoeing, watering, weeding, or plucking vegetables, the rounding the beds prevents any stagnation of water, the keeping the top of the ground loose prevents it from caking, and (as I have shewn you) from drying below, and saves much expense in watering, giving also much more time to the men for their other work. I only have three *malis*, but if

I watered as the natives do, I do not think I could do without nine.

Mr. Mechi, the model farmer's opinion is, (and I must say at first I adopted it against my will,) that all plants will go down for water, if it is not given them artificially. I also saw in a pamphlet he wrote on the principle of not watering, that he had followed a parsnip grown on this principle by digging down alongside of it as far as seventeen feet deep, and then did not get to the end of it. There is certainly a great difference between the climate of India and that of England, both as to heat and rain, but I am satisfied that a plant will go down for water, if it is not given it artificially, and if the ground be kept loose at top, but if you once begin to water a plant freely, you must continue it, or it will not thrive afterwards.

I do not, however, think, as a general rule, you will get vegetables so soon, or large, by watering sparingly, as by flooding them, cauliflowers particularly; but they will be of much better flavour, if the ground is well manured. This last year, I had cabbages, peas, radishes, and some other vegetables on table before they could be procured in the bazar.

Tobacco.—From Havannah seed grows very well, especially if well manured. I have grown some, and had it made into cigars, and though I am not acquainted with the process of curing it, I find some of them as good as Havannah, though they have only been made up about four months; and this opinion has been expressed by many who have tried them, but that they want age. I sowed the seed in pots; when the plants had about four or five leaves, I put them in the ground, covering them with a *cutchoo* leaf over them for the first three or four days, to prevent the sun from injuring them in the day. The three lower leaves were plucked off, as the plant began starting upwards, when the buds formed, they were nipped off, (except those kept for seed,) and all shoots were also nipped off; this is to throw all the strength of the plant

into the leaf. When the leaves began to turn colour, I had them cut and laid on the grass, where they remained day and night till they began to turn a greenish brown, they were then packed in the evening, when they ceased to be crisp, (but not damp,) and packed one on the other, and put inside the house. When I found them inclined to heat, they were opened out to cool and dry, and afterwards repacked. This operation was continued till it heated no longer, or remained cool, when packed. Not being able to pay attention to it myself, I had to leave it to my *mali* who frequently neglected it, consequently much of the leaf was completely spoilt; but I am satisfied that as good tobacco can be grown in Calcutta as any where else, and, if properly cured, will make as good cigars as the Havannah.

I have re-opened this to say a word or two about tools for the garden, for nothing can be more clumsy than the native *kodali*, and with it the *mali* never covers his weeds or manure when spread on the ground. The spade is the best tool for breaking up ground, either new or old; the manure may be spread on the ground, and dug in, leaving it well covered. The *neerinee* should be discouraged as much as possible, except for weeding paths and pots. There is not a thing that teaches laziness more than the *neerinee*. The rakes sold in Calcutta, are not strong enough, and they are a quarter too short; the teeth, instead of being square, should be flat, the edge towards the handle. A good sharp Dutch hoe is best for cleaning flower beds of small weeds.

The half mattock is the most useful tool, as it can be used for almost every thing, and the natives, after using it, allow of its being lighter and handier than the native *kodali*. I have one in my garden. Hoes of a smaller width are best in weeding out, and thinning vegetables and flowers, and for plots a small pointed hoe should be used. The point being the only sharp part, the side will

not cut up more than you wish to. I intend to get a few wrinkles in garden tools at home. Of liquid manuring or watering, I have said nothing, as I have had but little experience in it, but I used to find it advantageous to put some well rotten manure into the water-pot, fill up with water, and shake it well. This species of manuring requires care and experience, or the plants may be rotted by giving it thus too strong. It should always be hoed on the next day, or it will form a greenish top to the ground, that is unhealthy to the plants.

ADEN, EN ROUTE FOR ENGLAND :

January 27th, 1858.

Report on samples of Flax raised in the Punjab and N. Berar.

To the MEMBERS OF THE FLAX COMMITTEE

GENTLEMEN,—By desire of the Society, I beg circulate for the favor of your opinion, sundry small samples of Flax, &c., from the Punjab, and from N. Berar, as detailed on the other side. Extracts of notes from Major Burnett and Capt. Campbell are annexed. Mr. Cope's memo. merely states that he wishes to know what is thought of the flax, and its probable price in Calcutta.

I am, &c.,

CALCUTTA :

November 25th, 1856.

A. H. BLECHYNDEN,

Secy. A. and H. Society.

List of samples circulated.

Samples of flax 1 to 8. Raised from foreign and indigenous seed in various parts of the Punjab, as stated on the tickets affixed to each sample.

Sample of hemp.—(*Cannabis sativa*). Raised at Kote Kangra in the Punjab.

N. B.—The above from Mr. H. Cope.

A sample of flax raised at Woozecrabad and prepared at Lahore. Received from Major Burnett.

A sample of raw flax and two pieces of canvas made from it at N. Berar. Received from Capt.*Ivie Campbell.

Extract of a letter from Major BURNETT, Secretary Agri.-Horticultural Society of the Punjab, dated Nov. 4th, 1856.

"The flax was grown in the Wuzecrabad district, and prepared by natives under the superintendence of the Society. Allowances must be made for a very bad season. I have sent a sample home, but I will feel obliged if you will let me know what is thought of it in Calcutta, and its value."

Extract of a letter from Capt. IVIE CAMPBELL, Deputy-Commissioner Berar, Boldana, dated October 9th, 1856.

"I have the pleasure to advise you of the despatch of a parcel containing a small quantity of flax prepared in this district, and of two samples of coarse canvas made from it, the coarser variety by prisoners in the jail. I am sorry I cannot tell you the price of the fibre; it was made by private individuals competing for prizes offered by the Resident at Hyderabad. Although this district furnishes a large proportion of the linseed which is exported from Bombay, and last year there were more than 100,000 beegahs of land under the cultivation, the people were not aware that the plant, which is sown wide apart, for seed only, produced any fibre. The present is a mere experiment, and much could not be expected from it. Here linseed is a rubbee crop, and the sowings will commence immediately, so that I shall look out anxiously for the supply of Riga flax seed promised by you. As prizes will be again awarded this season, I hope that a superior article will be exhibited."

Report by Mr. John Stalkartt.—I consider all these specimens of flax creditable, excepting that from Berar,

which I attribute to not having a good description of country seed; as you will perceive that No. 1, from India seed grown at Goograwalla far surpasses it, Nos. 6 and 7, appear weak, No. 2 and 4, grown from indigenous seed are worthy of *attention and encouragement*, as they nearly approach the Irish flax.

No. 5, is decidedly superior from length and strength, &c.

No. 3, from India seed, grown at Haffizabad, is worthy of great attention and encouragement.

No. 8, I am inclined to think the best of all, it surpasses No. 5, in softness.

The sample from Wuzcerabad is very good, and deserving of encouragement and attention.

The above samples of flax it is, I think, not possible to value in this country; comparing them however, with that returned by the Dundee Chamber of Commerce,* would show that they were not less in value than 35£ per ton in England, and I suppose above that. I propose that they be sent to England to be there valued, and a sufficient quantity, so that some portion may be left in different marts in England for business purposes, &c.

With respect to the hemp grown at Kote Kangra, I consider it good, and should like to see more of it in bulk.

CALCUTTA:

January 3rd, 1857.

Report by Mr. W. Thomson.—I have carefully examined the samples of flax and hemp, referred to in Mr. Stalkartt's letter of the 3rd ultimo, which I return herewith.

I entirely concur in Mr. Stalkartt's remarks, to which I have nothing to add, except that the sample of flax from Berar appears to have been very much injured by over-steeping,

* See a favourable report by Dundee Chamber of Commerce on a sample of fibre prepared from straw grown at Allyghur from native seed, and after the native fashion, solely for the sake of the seed.—(*Journal*, Vol. IX, p. 379.)

although the fibre originally must have been inferior both as to length and strength. In its present state it is only fit for mixing with jute, or for paper making.

CALCUTTA :

February 13th, 1857.

Memorandum on a sample of Farina prepared from the Tenasserim yam (Dioscorea fusciculata); and on a sample of Molasses from date juice : By G. EVANS, ESQ., Surgeon.

As a memo. to serve in laying before the meeting the sample of farina and date tree Molasses I placed at your disposal, I may state that the former, in the proportion noted on the label (about two-fifths of the weight of tubers), was prepared by me from the Tenasserim yams obtained through my friend Mr. Rose from the Society.*

I have omitted to try it with boiling water, but have no doubt it has much the character of common arrow-root, and the tubers, in yielding a larger per-centage than the *Maranta arundinacea*, might obviously be cultivated to advantage for this product alone. The Molasses is from the sugar of the date tree, and the sweet is less palatable to the taste than that from sugar-cane. This appears to be owing to a portion of chloride of soda contained in it, derived no doubt from the soil the date tree delights most to dwell in.

From its strong resemblance in taste, colour,* consistence and smell to Chinese or "*Japan soy*," I should very much question the accuracy of that esteemed sauce, being as is asserted, the product of the *Dolichos* pod or bean.

I have every suspicion that in the present age of prevalent wholesale sophistication, when our commonest articles of daily consumption are adulterated to a most alarming extent, rendering it indeed difficult to know what we

* "Under the microscope it resembles fine potato starch, and, if perfectly freed from all foreign substances, will prove as good as the general run of arrow-root."— (*Extract of a note from Dr. F. J. Mouat.*)

really do eat and drink, that which we call, and is sold in England as, "*Japan Soy*," is nothing more than a fabrication of cane Molasses and common culinary salt, as a careful comparison of a mixture so made, and the so-called *genuine* article will clearly show. Indeed I have no doubt, that most of what is sold in England as "*Japan Soy*" is manufactured on a large scale by the sauce and pickle makers at home, and such as does actually find its way to England from China, is no other than the Molasses of the date tree, with a fair sprinkling of common salt to preserve it, as with our *chutnies* and Indian sauces, from fermentation, and the decomposition it would otherwise spontaneously undergo.

Report on raw Silk from the mulberry worm raised in the Punjab; and on cocoons of wild silk moths from Moulmein.

To the MEMBERS OF THE SILK COMMITTEE.

GENTLEMEN,—By desire of the Society I beg to circulate, for the favour of your opinion, certain specimens of raw silk from the Punjab, and cocoons of wild silk from Moulmein, as per list annexed.

I am, &c.,

METCALFE HALL :
November 25th, 1856.

A. H. BLECHYNDEN,
Secy. A. and H. Society.

P. S.—For the sake of comparison, I circulate a specimen (4 skeins) of raw silk received from the Punjab Society in 1854, together with the Committee's report in original on it.

I have addressed Capt. Haughton for further information respecting the smaller of the two kinds of cocoons received from him.*

A. H. B.

* In a letter to my address, under date 23rd March, 1857, Capt. Haughton writes as follows from Tavoy :—

9 skeins of raw silk from Cashmere silk, wound at Lahore by Bengalees; received from Major F. C. Burnett, Secretary A. and H. Society of the Punjab.

4 samples of silk from Mr. Cope, as follows:—

No. 1.—Cocoons from Bengal eggs, (monthly) with three ounces of silk, wound from 414 cocoons of the same kind at Lahore.

No. 2.—Cocoons bred between a Bengal monthly male moth and a Cashmere annual female moth, with three ounces wound from 264 cocoons of the same kind.

No. 3.—Cocoons from eggs produced by a Bengal monthly female moth with an annual Cashmere male moth, with three ounces of silk wound from similar cocoons.

No. 4.—Specimens of silk wound at Lahore from annual Cashmere cocoons bred at Hoshearpoor.

A small box containing the cocoons of indigenous *tussurs* and another silk producing moth of Moulmein. Received from Capt. J. C. Haughton.*

Report by Mr. W. G. Rose.—The 9 skeins.—A good useful sort of silk, but not equal in quality to the 4 skeins of 1854.

Mr. Cope's Nos. 1 to 3.—All three capital silk, very nearly of the same quality. I look upon No. 3, as perhaps the best, although not the finest thread.

Mr. Cope's No. 4.—Very inferior, and not half the value of the other three.

"I regret I can give you but little information regarding the silk-worm, the more so, as having left Moulmein, and the insects apparently not extending so far South, I cannot obtain it from others. The large moth appears to me identical in its habits with the *tussur* moth. The small one I only observed upon the cashew-nut tree (*Anacardium orientale*), which though exotic, has thoroughly taken root both here and at Moulmein, and is now to be found in every native garden"—A. H. B.

* Since writing the foregoing, I have had an opportunity of examining these cocoons with those in the Museum of the Asiatic Society, and find it to be similar to the *Saturnia trifenestrata* of Helfer. See his account in *Journal of the Asiatic Society*, Vol. VI., page 45. The worm "lives on the Soom tree in Assam, but seems to be not much used."—A. H. B.

I am no judge of *tussur* cocoons, and cannot therefore give any opinion respecting them.

The other cocoons from the silk producing moth of Moulmein are perforated as before, and appear to me worthless, as I do not think they can possibly be reeled.

Report by Mr. Joseph Willis.—On the 9 skeins of raw silk wound at Lahore by Bengalees under the superintendence of Major Burnett, Secretary A. and H. Society, Punjab :—

These are good silk, of medium size and useful quality ; rather harsh in the getting up, but healthful, strong, and pretty evenly wound, with freedom from foulness and slubbiness.

They do not possess the excellence, delicacy and European-like character and value of the four specimens of silk exhibited from the Punjab in 1854. But they are superior to the ordinary run of Bengal bazar raw silks, (now however improved in their getting up,) say on such as we have for years been in the habit of trading in at Calcutta.

On the 1 specimen skeins of raw silk and cocoons prepared by Mr. H. Cope in the Punjab :—

No. 1.—From cocoons of Bengal eggs, viz., the monthly one. Excellent silk, palish colour, cocoons small, 414 cocoons giving 3 ounces silk.

No. 2.—From cocoons, hybrid male Bengal (monthly) female Cashmere (annual). Excellent silk, fuller, range yellow colour, cocoons much larger than those of No. 1, 264 cocoons giving 3 ounces silk.

No. 3.—From cocoons hybrid male Cashmere (annual), female Bengal (monthly). Excellent silk, fuller orange yellow colour, nearly equal to No. 2 ; cocoons, resembling those of No. 2, but in some instances somewhat less in size, and varying more in colour than No. 2, 276 cocoons giving 3 ounces silk.

These hybrid productions under Nos. 2 and 3, appear to me to be very interesting and valuable.

No. 4 are 3 skeins wound at Lahore from the annual Cashmere worms bred at Hoshearpoor. These are harshly got up specimens of *coarse* silk, rather uneven in the winding, colour low and various, suitable for ribbon, &c., manufactories.

On the box of *tussur* cocoons, and another silk moth's cocoon, sent up by Capt. J. C. Haughton from Moulmein.

All that I can observe is, that their appearance, and especially that of the *tussur*, is large, and splendid looking, but I have no means of making comparisons with those of the like kinds from other localities, and therefore cannot specially report on them.

CALCUTTA :

March 7th, 1857.

Notes regarding an useful substance from Moulmein, called Pwai-nyet, and the bee which produces it.

In April, 1857, Sir Archibald Bogle, Commissioner of the Tenasserim Provinces, forwarded to the Agricultural and Horticultural Society of India a specimen of a substance called *Pwai-nyet*, procurable at about one anna ($1\frac{1}{2}$ d.) per pound in those provinces. Sir Archibald states that this material has only to be moistened with earth oil till of the consistence of paint, and then spread with the fingers on a bit of cloth on the cracks of the roof of a house to make it quite waterproof, and to stop all leakage whatever; and it dries in an hour or two. Sir Archibald adds that having found it most valuable, he thinks it very desirable to bring it to the notice of the Society.

Sir Archibald having left India for Europe shortly after the receipt of the above specimen, the Society preferred a request to another member resident in the Tenasserim Provinces, the Rev. C. S. Parish, for further information as to the nature of the material in question, whether vegetable or mineral—and for any additional particulars he could obtain. In reply, Mr. Parish has been kind enough to

supply the following interesting information in a letter dated from Moulmein, 20th May :—

“The substance, about which you seek information is, as Sir A. Bogle stated, commonly procurable in Moulmein-bazar, and at *about* one anna a pound. I lately bought, I think, 5 viss for 1 Rupee. It is not a vegetable substance, but it is the result of the labours of a small bee. (Probably however it is the mixture of various gums and resins gathered by the bee). Fortunately, since receiving your letter, I have met with a small colony of the *dammer* bee at work in a hole of an old teak-post. I have the pleasure to send you by this mail a small piece of the substance, for identification, taken out on the point of a knife, also two specimens of the industrious little creature itself, enclosed in a glass-cell. I am not an entomologist, but shall be glad to know the name of the *Opifex*. If any of your entomological friends think the species of interest, I will try and catch them some more, *as I believe it has no sting*. I have not indeed submitted them to the microscope, but though numbers settled on me and flew round me, as I disturbed them in their work, I felt no evil consequence. The bee makes his *nest* of this substance, which is at first soft and plastic by the fingers, and extremely glutinous, but afterwards on exposure to the air becomes dry, hard, and brittle. The nest, I believe, is made indifferently in a hollow tree—in a hole in the ground, or, as in the present instance, in that of an old post. When bought, it is commonly in a large irregularly shaped lump, rudely honey-combed—mixed with much extraneous matter. It is soluble in oil—any oil I fancy, at least I find that *olive-oil* answers the purpose of detaching it from the fingers as well as wood-oil. It is a well known and commonly used substance here, but, though frequently noticed, mistakes as to its true nature have often been made, chiefly owing to the fact that the name of *dammer* is given to it in the bazar.

by the natives of India, who *sell it*, in common with many other resins and gums, which in appearance and quality it resembles. *It is not dammer*, though if you ask for *dammer* in the bazar, it is as likely that you will have this substance offered to you as any other. The Burmese know it only as *Pwai-nyet*. They use it for caulking generally, mixed with wood-oil over a fire, and it answers its purpose admirably in the case of *wood* work—but whether of pukka or chunam work also, I cannot say.”

In a subsequent communication from Moulmein, dated 15th October, Mr. Parish sent another and cleaner sample of *Pwai-nyet*, with the following remarks :—

“I have the pleasure to forward by this mail a small box containing a bottle with *Pwai-nyet*. I send it as a good specimen of the substance when clean for the shelves of your museum. When out botanizing the other day, I came upon it ; I gathered it off a rock, the pieces sent in the bottle forming the covered ways by which the bees approached their nest under ground. The nest I did not disturb, as it would not probably have been reached without some trouble, but these covered approaches, being numerous, and reaching upwards about a foot or 18 inches above the ground, afforded me excellent specimen pieces of the substance. It was found on a rock about 100 feet high at the back of Moulmein. The bees also enclosed do not come from that nest, but are from the same post in Moulmein, out of which I procured the first sent. Thinking there might be some entomologist among your members, who would like to have the insect, I send three cells with five in each.”

The little insects received with Mr. Parish's first letter were forwarded, at the suggestion of Mr. W. S. Atkinson, Secretary of the Asiatic Society, (who was unable to identify them), to Mr. Frederick Smith of the British Museum ; and the specimen of the substance prepared by them has

been sent to the Society of Arts, to obtain the opinion of practical men interested in such products. The report from the Society of Arts has not yet been received, but the Committee have the pleasure to introduce the following letter from Mr. Atkinson, and the extract therein referred to from Mr. Smith's paper on the *Hymenoptera* of Singapore:—

MY DEAR SIR,—The last mail has brought me a communication from Mr. F. Smith, in reference to the small bee which produces the substance called by the Burmese *Pwai-nyet*, specimens of which were sent to your Society by Mr. Parish from Moulmein, and were, by your permission, forwarded by me to Mr. Smith for determination.

It will be seen that the species has lately been described and named by Mr. Smith, from specimens procured by Mr. Wallace at Singapore.

It will be interesting to determine the geographical range of this useful insect.

Mr. Smith says:—

“I received your letter and the specimens of the little bee from the Tenasserim Provinces. I had examined it carefully, and compared it with specimens collected in Singapore by Mr. Wallace, and find them the same species. In the last part of the *Journal of Proceedings of the Linnean Society*, Vol. II, No. 6. I published a paper on the *Hymenoptera* of Singapore, Malacca, and Borneo, collected by Mr. Wallace. In this I described the little bee. Its name is *Trigona læviceps*, Smith. All the species of this genus, and also of its ally *Mellipona*, are destitute of stings. You will no doubt receive a communication from the Society of Arts on the composition of the product sent.”

Allow me to suggest, that it would be useful to republish Mr. Smith's description of this species in your Journal.

Believe me, &c.,

CALCUTTA:

W. S. ATKINSON.

Februury 1st, 1858.

"*Trigona læviceps*. T. nigra; capite lævi et nitido, antice pube cinerea tecto; thorace nitido,* alis sublyalinis, abdomine castaneorufis.

"*Worker*. Length $1\frac{1}{2}$ line. Head and thorax black: the face, above the insertion of the antennæ, smooth and shining; the antennæ rufotestaceous; the clypeus with a hoary pubescence; its anterior margin, and also the mandibles, ferruginous. Thorax smooth and shining, the metathorax highly polished; the wings sublyaline and iridescent, the stigma and nervures ferruginous, abdomen ferruginous, smooth and shining. *Hab.* Singapore."

Report on Tea grown at Tugvor and manufactured at Darjeeling.

To the MEMBERS OF THE TEA COMMITTEE.

GENTLEMEN,—By desire of the Society, I have the pleasure to circulate, for the favor of your opinion, two musters of tea from Darjeeling, grown and prepared by Capt. J. Masson. A note from the Rev. Dr. Boaz, also circulated, affords the only information we possess regarding them.

I am, &c.,

METCALFE HALL:
November 16th, 1857.

A. H. BLECHYNDEN,
Secy. A. and H. Society.

Extract of a letter from the Rev. Dr. Boaz, Calcutta, dated November 8th, 1857.

"I send you two specimens of tea grown by Capt. J. Masson, of Darjeeling, at his tea plantation at Tugvor. Tugvor is a northern spur of the Darjeeling hills, and these specimens of tea were grown at, I should think, an elevation of about 4,500 feet. No. 1 is apparently a good strong tea. No. 2 appears to me to be a finer tea, with a more aromatic flavour. I regret that Capt. Masson has not sent any particulars as to the seed from which the plants have been raised, or the

age of the plants. From what I know of the plants, I should say that they have now arrived at maturity. The plants have been raised and the tea has been prepared by Capt. Masson.

"It came down soldered up in tin, and this may have interfered with the flavour.* I have tasted tea made from similar preparations at Darjeeling, and considered it of very fine flavour."

Extract of a second letter from the Rev. Dr. Boaz, Calcutta, dated December 8th, 1857, received after the musters of tea were circulated to the Committee:—

"I have received further information about the tea grown on Capt. Masson's estate at Tugvor in the Darjeeling hills; specimens of which I sent you last month. The elevation is about 4,500 feet. The soil consists of a rich black mould, from five to eight inches deep, the sub-soil is a reddish clay. The plants from which the tea was gathered are from four to five years' old. They were obtained from Lebory, near Darjeeling.

"Capt. Masson states that he has had seed both from the Upper Provinces and from Chinahut, scarcely any germinated. The seed gathered from the plants grown in the Darjeeling hills have all germinated and flourished; they had become acclimated. He has now a fine field of these young plants from 8 to 11 inches high.

"Capt. Masson hopes that the tea he will prepare in April next will be superior to the specimens already sent. It will be prepared on the plantation, whereas the specimens now with you were brought up to Darjeeling, and prepared there, which did not improve the leaf."

Report by Messrs. F. Pereira and J. Agabeg.—We have tasted the two musters of tea sent by you and prepared

* It is about the best mode of sending it down. Eds.

by Capt. J. Masson, of Darjeeling, and sent to you by the Rev. T. Boaz of Calcutta.

We find the tea marked No. 1 a very good specimen of Pouchong, fine flavour, and will no doubt, with careful preparation, prove hereafter equal to any Pouchong grown in other parts of this country, Assam, Cachar, &c. No. 2 tea is coarse, and not so well prepared, and can be compared to inferior Chinese Congo, and has the taste of old tea, without much flavor. We are of opinion however that with careful preparation, this may be made a very good Congo tea.

On examination, we found the leaves very well prepared, and if the tea had been regularly superintended by Chinese cultivators, we feel sure that no better tea could be produced in India.

CALCUTTA :

December 21st, 1857.

Report by Mr. T. E. Carter.—I have tried both these samples of tea. No. 1 is a very good specimen, having been carefully made; the infusion is pale and weak, like most fine China teas, but the flavour is exceedingly delicate. No. 2 is inferior in quality, but still a very fair article. These teas do not resemble any that are usually made in Assam, and I am therefore unable to state their comparative value. This can be *best* ascertained by a reference to some of the great London tea brokers, and I shall be happy to transmit samples, for the purpose of obtaining their opinion, should such be the desire of Capt. Masson.

January 6th, 1858.

Report by Mr. C. A. Cantor.—I have infused in boiling water part of the two samples of Darjeeling teas. I find sample No. 2 large leaf black tea, *not* of the same fine flavour as sample No. 1. In London, the value of No. 2 tea is about 1s. 3d. per. lb. No. 1 sample is a fine flavoured black tea, value about 1s. 10d. per. lb.

• *January 15th, 1858.*

*Report on certain descriptions of Indian Grasses in reference
to their applicability for Paper making.*

(Communicated by the Society of Arts.)

At the monthly meeting of the Society in February 1856, communications were read from Col. Jenkins, the Commissioner of Assam, Dr. R. Riddell, and Mr. J. H. Bridgman of Gorruckpore, respecting Indian materials for paper manufacturing (see *Journal*, Vol: IX, p. 83, *App.*): It was resolved at the same time, that a few bales of the various grasses referred to by those gentlemen should be transmitted to the Society of Arts, with the view of ascertaining whether any of them contained the necessary ingredients for paper manufacturing, superior to the common rush of England. The kinds sent were the "Kusseah" (*Saccharum spontaneum*, Lin.); the "Wooloo" (*Saccharum cylindricum*, Lamark); the "Hooghla" (*Typha Elephantina*, Roxb.); the "Madooree kattee" (*Cyperus tegetum*, Roxb.) and the "Paddy" (*Oryza sativa*).

In April, 1857, the Society received a report on these grasses in the following communication from Mr. Foster, the Secretary of the Society of Arts, dated 12th March:—

"I have had the bales of straw examined by competent judges (paper-makers), and they are of opinion that none of them are well adapted for the making of paper, though there is no doubt of course that paper can be made from them all. The common rice straw would make the best. They consider all the samples as very inferior in paper-making quality to many substances which can be obtained here readily, and even then are not worth using. Materials *well fitted* for making paper can be bought and delivered at the paper-mills for less money than the mere freight from India of any of the materials you have sent.

"There is much misapprehension abroad as to the want of paper-making materials here. For first-class papers and

for inferior papers there is no want of materials at all, but for medium paper for printing purposes there is *some* scarcity of material, as evidenced by the somewhat higher proportionate price given as compared with the price of materials for other classes.

“New materials involve new machinery for reducing them to pulp, and the older paper-makers have not yet established machinery suited for those new materials in addition to that at present in use. Some enterprising men are beginning to take the matter up, and are laying themselves out to make pulp or half stuff for sale to the paper-maker, and it will be by those men that any new materials will be worked. It is to them that I have shown your materials. The regular paper-makers would scarcely look at them.”

*On the mode of drying the Indigo leaf and manufacturing it,
as pursued in the Madras Presidency.*

(Communicated by G. J. FISCHER, Esq.)

MY DEAR SIR,—I shall be much obliged by your obtaining information from some parties in the Madras Presidency regarding their mode of drying the indigo leaf, and of manufacturing it into indigo, and also if their plant is the same as ours? Should it not be the same, I shall be glad to receive some of the seeds and dried specimens of the leaves of their plant.

My opinion is, that if we could dry our leaf and prepare indigo from it, we should make fully from 10 to 20 per cent. more without increasing our cultivation, as an immense quantity of our leaf is invariably lost, and often thrown away at our factory ghats, especially when there is an high or sudden inundation.

CALCUTTA :

• April 21st, 1857.

Yours, &c.,

HENRY FRENCH.

“The mode of drying the Indigo leaf is effected by sowing the plant at the end of the monsoon, so that it should be fit for cutting when the hot weather sets in. On the coast, the weather admits of this being done two or three times, not so in the interior, we seldom could get more than one cutting. The plant is cut early in the morning, and spread out on ground prepared for it, and exposed to the sun. Towards the evening, or when the sun has lost its power, the stalks are shaken and thrown away, and the leaf gathered in, and by stowing away in great quantity and repeated dryings, it becomes pulverized before it is used. To dry in perfection, the hottest sun is required. If the least rain falls, or the weather is cloudy, much of the leaf is spoilt, sometimes altogether, and is thrown away; at other times it is so damaged as to yield only very inferior indigo.

“It was because this process of drying the leaf in the interior was subject to so many accidents that we resorted to the green leaf process.

“From experiments, I found that the same quantity of leaf by weight, whether green or dried (that is the same quantity of green leaf dried,) produced the same quantity of indigo. The indigo from the green leaf is of 50 per cent. more value, and the refuse of the vats in the green leaf process, is ten times the value of that of the dried, and so valuable is this refuse, that if a native has *ninjay* lands, he is satisfied with the refuse of the vats, and cares not if he derives no profit in the indigo.

“The mode of manufacture is the same in this case as in the other, with the exception that the dried leaf only requires from one to two hours’ steeping.

“Our plant is the same as that of Bengal, indeed it was from Bengal that we got the seed originally.

“After what I have said above, I don’t think your Bengal friend will be disposed to dry his leaf, indeed it never will answer in Bengal.”

J. FISCHER.

MY DEAR SIR,—Many thanks for your communication of the 12th instant. I am about to try the dry leaf system as an experiment in a small way, for if we can make any thing of it, it will be a great saving to us, as much leaf is lost every season, and especially so in a high inundation, when we often pitch hundreds of bundles of plant into the river daily, from not having vats enough to manufacture the plant delivered by the ryots under contract, and which we have to give them credit for, although we can make no use of it.

BURRAY, VIÂ MAGOORA :

June 15th, 1857.

Yours, &c.,

HENRY FRENCH.

Report on Coffee raised at Jorehaut, in Upper Assam.

To the MEMBERS OF THE COFFEE COMMITTEE.

GENTLEMEN,—I have the pleasure to submit, for the favour of your opinion, a sample of coffee recently received from Col. Jenkins, Commissioner of Assam. Col. Jenkins does not mention from what stock it is derived, he merely remarks that it has been raised on Mr. Williamson's tea factory, Cinnamara, near Jorehaut, and that it appears to him better than the ordinary samples previously sent from Assam.

Yours, &c.,

METCALFE HALL :

December 17th, 1857.

A. H. BLECHYNDEN,

Secy. A. and H. Society.

Minute by Mr. James Cowell.—This is a very fine specimen of coffee grown in Assam. It appears to me to be from Mocha stock originally, having the properties generally of that description of coffee. The berry is somewhat larger than the Mocha, which arises probably from being grown in a moister climate and richer soil, where the plants, as in Lower Bengal, yield larger beans and more abundantly, but to the prejudice of the fine quality and aroma of the coffee. This specimen will be greatly improved by age; its value in the London markets by last advices may be assumed at 62 to 64s. per cwt. Col. Jenkins might send down a small

quantity for transmission home for the opinion of the trade.

December 18th, 1857.

Minute by Mr. C. A. Cantor.—It is a fair specimen of coffee; resembles Sumatra coffee; berry smaller than Sumatra coffee; value in London about 60s. per cwt.

(Extract of a letter from Col. JENKINS.)

“With reference to your letter of the 21st December last, forwarding the Committee’s opinion on the sample of coffee sent down by Mr. Williamson of Cinnamara, Jorchaut, and proposing some questions regarding the plants, I have now the pleasure to forward a letter from that gentleman answering your queries. It appears from another note of Mr. Williamson, that the original seed was first sown at Gowhatty, and from those plants seeds were sent to Sibsaugor, and thence seeds were sent to Mr. Williamson, so that altogether we have had the stock ten or twelve years in the province, and the plants from the imported seed have been grown in three distant and distinct localities.

“This seems the more favourable to the character of the province as to its capability of growing coffee, for Mr. Williamson’s sample shows, I think, little deterioration, and from what I have seen of the coffee produced at Gowhatty and Sibsaugor, I have little doubt but it has been improved by removal to Mr. Williamson’s factory. The berries are smaller, heavier, and greener, than what is generally produced here and at Sibsaugor.

“Mr. Williamson now proposes to try the coffee in two or three new localities, all being higher grounds than his own lands at Cinnamarra.

GOWHATTY:

February 4th, 1858.

“I have much pleasure in acknowledging the receipt of your favour of the 29th ultimo, enclosing the Committee’s report on the sample of my coffee you were so kind as forward, and which, I am glad to see, has been much

approved of. I beg to annex answers to the several questions relative to the coffee plants, &c., which are—

1st.—From what stock the coffee has been derived?

A.—From Mocha stock, acclimated at Gowhatty by the late Dr. Scott.

2nd.—The age and height of the trees?

A.—Age of plants three years, height varying from four to six feet.

3rd.—If raised in an open space, or within the influence of shade of any kind?

A.—Shaded from the afternoon sun.

4th and 5th.—If they have borne previously? In that case, whether more than one plucking is obtained in the year?

A.—This is the first year's crop, and only one plucking has been obtained.

“I regret that I have not the required quantity of coffee to send to the Society to be forwarded to England, as I have dried the greater portion in the husk for seed, but from my next year's crop I shall have pleasure in doing so.

JOSEHAUT :

GEO. WILLIAMSON.

January 30th, 1858.

Report on Vanilla pods, the produce of the Society's Garden.

In December, 1856, the late gardener (Mr. McMurray) submitted a quantity of Vanilla pods raised in the Society's Garden, with a brief notice of the treatment of the plant (see *Journal*, Vol. IX, p. 316). These pods were sent, in March, 1857, to the Society of Arts, and the following is the report on them enclosed in a communication from Mr. Foster, the Secretary, dated London, 14th December, 1857:—

“The Vanilla pods have been in the hands of one of our oldest and largest firms as confectioners; they report as follows:—

- “We have used the Vanilla sent, and find the strength good. The pods were very small, and were much dried, in

Moreton Bay Chesnut.

consequence of being packed in wadding instead of being wrapped in tin-foil, and packed in the tin-case; we consider it of good quality. To make it of commercial value, the pods should be long, and of a very dark brown colour, almost approaching to black. They should also be moist, and if properly ripened, before being packed, they become after a time covered with minute acicular crystals, which much add to their appearance and marketable value.

“The value of the Vanilla sent is about 50s. per pound. Had it been fine (say one-half longer), and in the condition mentioned above, it would realize from 80 to 90s. per pound.”

“The present price of Vanilla is about 20s. per pound above the average value.”

Notice regarding the Moreton Bay Chesnut, introduced into the Government Garden at Bangalore: By H. CLEGHORN, M. D.

I have the pleasure to forward drawings of the Moreton Bay chesnut (*Castanospermum Australe*) and European olive (*Olea Europea*), which have now been introduced for some time into the Bangalore garden, and which (the former especially) seem to like the climate remarkably well. The chesnut is occasionally eaten by the people, but the seeds, being prized, are reserved for propagation. There were about eighty pods suspended from the tree, from which the twig is figured, and whose fruit I forwarded to you by last steamer.* The olive does not flower freely, and only fruits occasionally, although it attains the height of twenty to thirty feet.

One large litchi tree was this year laden with fruit, and I have put down many layers, with a view to its transmission to the Wynaad and Coimbatore. Another tree of interest in the Lal Bagh, is the *Calysaccion longifolium*, of which a whole avenue is now in fruit.

* The seed germinated readily, and there are now several healthy plants in the Society's Garden.—Ebs.

Correspondence and Selections.

PARTICULARS REGARDING CERTAIN SPECIMENS FORWARDED DURING
1857 FOR THE GARDEN AND MUSEUM OF THE SOCIETY; WITH
NOTICES RESPECTING THE FLORA AND VEGETABLE PRODUCTS
OF UPPER ASSAM.

(Communicated by Capt. W. H. LOWTHER, 2nd in Command Assam
Local Battalion.)

"I am delighted to find that Government have put such facilities in our way regarding the transmission of plants; it will be indeed a great boon to this neglected but rich country. Suddyah ought in time to be the garden of Assam, as is Jorehaut at present, with its groves of oranges, orchards, &c., &c., the remains of the royal government. I must tell you that Suddyah has a soil and climate unmatched in the whole N. E., the surface stratum being a black alluvium about a foot deep,—below that many feet of sand, being the original bed of the Burrampooter. There, potatoes and onions, both which will not grow at Deebroo, and many other places, attain the greatest perfection; here, the former, taking the pick, are Rs. 1-8 as. per maund, the latter 2 as. per seer, while at Deebroo (only 60 miles off by boat) Rs. 2-8 as. to Rs. 3 are commonly asked for the former, and the latter are scarce at *one Rupee* the seer.

"Will you be so kind as to have notes made from time to time as I write to you of my requirements, as otherwise both of us will forget them.

"First, all *spare* specimens of potatoes (*large and new sorts*), yams of every description, and a few seers of *Arachis* pods. We have a lazy population, and rice often reaches famine prices, when the miserable creatures eat any wild rubbish they find in the jungles, and lay the foundation of diseases; hence the need of some *prolific* roots: besides, oil is so scarce and dear here (*Cocou-nut oil in retail 40 Rs.*), that the *Arachis* will certainly prove a god-send. That splendid maize I have been distributing for hundreds of miles; Mishmis, Singphoos, and other tribes, have received a small quantity for sowing in their very suitable hills, and I have, besides giving the sepoys and ryots at Saikwah and Suddyah a small share, made two sowings for myself in two experimental plots at both places. I had some fine heads raised by Mr. Higgs' Abors given to me, they were attacked by weevils, the husks having been removed (which should *never* be done, in Upper India they

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are very particular on this point), and found a use for that *naptha* I sent you. I removed all the grains, and shut them up in a small box, stirring among them a few drops of that oil; the insects immediately perished, and the corn seems to be none the worse for the application. You may possibly find this recipe worth knowing among your stores.

I am sending you a tin box of seeds, lately gathered, and drugs. Among the former, are several highly ornamental things, found in my late wanderings in the most uncivilised and uninhabited portions of the country, and they may possibly prove new to you; of the latter, I forward one large packet of the root *Aconitum ferox* (*Bih*), with which the savages poison all their weapons of war and the chace; it is superdeadly in its effects, even the elephant cannot resist its effects. The Singphoos are great ivory hunters, and they fire an arrow heavily imbued with the drug from an old musket into his head, and then track him till he drops! but there is a well-known and simple remedy for wounds made by these poisoned weapons, which I am at present investigating, and shall send you the result in due time. I am witness to its efficacy, for during a late raid of the savages on my beat, they, as usual, set poisoned foot-spears of sharpened bamboo during their retreat, and five villagers were desperately struck by them through the legs and feet; the remedy was immediately stuffed into the laceration, and, although the limb swelled as if it would burst, the men all recovered the use of it in a week or ten days. Next in importance I send you the far-famed "*Coptis teeta*" (*Mishmee teeta*), a root pronounced (*vide* O' Shaughnessy) by eminent medical authorities as possessing most valuable tonic or restorative qualities,—being an intense bitter (but it is not a febrifuge). It is very difficult to obtain, only a small quantity being brought down in presents and barter. Plants have often, I am told, been sent here, but they invariably died in a few months. I have ordered some in season for transmission, but they should leave for Europe as soon after receipt as possible. Should the accompanying packets not contain a sufficient quantity for medical experiment, I will send you more. There are four packets of "*Gir-thain*," the root of some "*Labiata*," evidently a favourite perfume in Assam, and used to scent hair-oil. Should any of these substances prove of value, I think there will be no trouble in obtaining a large quantity from the Mishmis, in return for spirits, tobacco, or salt,—three things they prize more than money, or indeed any thing else, perhaps, except *beef*.

SUDDYAH, UPPER ASSAM:

February 24th 1857

and vegetable products of Assam.

"I need hardly tell you how much gratified I was by the receipt of the two glass cases—"better late than never." They remained some days at Deebrooghur without my being made aware of their arrival—the distance is full seventy miles by the river; at length I met them on the 13th, as I was going down to visit some outposts of my "beat." I had heard previously that all the rose trees were *dead*, and to my grief so they seemed to be—and very little else but dry sticks; however, I sent word with them to Suddyah to give water plentifully, and put them in the shade. On my return, on the 26th, I was delighted to find seven-eighths growing vigorously, having thrown out a new crop of shoots and leaves! They are now all safe, transplanted into a small experimental garden in one of the best soils in Asia, but I am grieved to say that desirable acquisition, the *Amherstia*, arrived quite dead, evidently perished a fortnight before it reached Upper Assam—you must remember me again in the cold season. Nearly every thing else growing, barring two *Passifloras*, two or three *Bignonias*, and last, not least, the much coveted *Vanillas*, of which three alone are in existence, and those sickly; they have been sent without delay to the forest, where I had prepared for their reception,—do remember me again in this plant. In spite of storms and rain, we are in the most suffocating weather, and in my small huts, (an extempore bivouac) I remain till May, when I return to Deebrooghur. The jungles, are beginning to unfold their flowery and other treasures, and the birds, insects, and blossoms are *dressing*, at least in spring fashions, as gaily as your most gay Calcutta belles. Such a revelry of charms never was seen; the orchids are indeed *unearthly* in their gorgeousness, and make my poor human eye ache with their beauty. I am gradually filling the cases, but I am forced by the season into selecting *hardy* plants, so cannot be as dainty as I could wish. There are sundry parasitic and ground ferns, more of *Hoya parasitica*, *Hedychiums*, a *Polypodium*, that pretty parasitic orchid *Pholidota articulata*, some pseudo shallots—which come from Munneepoor, and seem better flavoured than our common Indian chives (*Gundeena*), and some other things.

"I wish I could have sent what I most admire, but my eyes are open, and in favorable time I shall do my best. A fine terrestrial orchid, with a large violet-coloured lip is now in full bloom; a lovely rose-coloured highly perfumed little *Magnolia* (a forest tree); a splendid lilac-coloured *Dalbergia* (climbing); a scarlet *Amaryllis* (in gardens); a free flowering pretty white *Ipomœa*, like our English bindweed; a shrubby jessamine, like *Tabernæmontana*; a very handsome *Cucurbit* with large white fringed blossoms, foliage like a *Passiflora*; an *Aralid* (?) with numerous

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upright spikes of rose and yellow flowers, (a large tree); and numerous other few and showy things.

"I have made you up a tin case of seeds, which you will soon get; a box also containing some packets of hill drugs, and a paper on our local pest, the *Solanum*?—dried specimens accompanying. I forgot to say that in your transmissions to me, send two strong plants of *sage*, and two also of *marjoram*, and any other pot-herbs you may have in the garden, down to rue and rosemary for my poultry.

"The various species of oranges and lemons in Assam would astonish you: in the garden at Saikwah, (the post I have just deserted,) is an orange tree forty feet high, and which bears thousands of fruit; several others of lesser dimensions. Lemons of the finest kinds *wild* throughout the forests, and a great treat to a thirsty, feverish explorer. I often come on a loaded tree, in the midst of a grass plain, without water near for miles: they are doubtless the remains of ancient cultivation.

"Any of your Chinese plants ought to do well in Assam; pray think of me if you have any to spare. I want as many handsome flowering shrubs as I can get, more pine-apples too, for they will do well that is certain, and also alligator pears. *Has that Ipomœa flowered yet I gave you?* [Yes.]—*I want seeds or a plant of it.* I am sorry to find few of our annuals will grow in Assam; they damp off shockingly, not a stock will reach four inches, and Californian flowers wither and rot most provokingly, long before they show buds. No cauliflowers either in my garden, beet bad, but most other things, especially peas, *first-rate*. Onions grow beautifully, but the country stock is bad; I want Patna, or Bombay seed, if procurable. There is a rough acid plum just coming in, like a sloe or wild damson—query, is it *Prunus Jenkinsii*?) would make good stocks doubtless for grafting stone fruit. I will send some seeds next box; some of those parasitic ferns are very tender of heat, and grow in places where the sun never shines, so for the present it is useless sending them, the dormant season will do very well without risk, in a light basket like the orchids. One or two very lovely kinds, though, I am sending, as they are so light and portable, and *may* survive the journey. *Do you know any white Erythrina?* [No, not in our garden.] By description I hear of one some miles off, and have ordered blossom, seeds and cuttings to be brought to me, to be certain on the matter. I want you to beg, borrow, or steal, any other kinds of *Passifloras* for me, this being the very climate they admire. We have that large eatable gourd-like passion-flower every where in gardens, just now it is loaded with green fruit, and self-sows itself most abundantly; a handsome flower too, this is *P. edulis*, I

and vegetable products in Assam.

think, a large growing species like a grape vine. The potato crops have just been dug, they are rising in price from Re. 1-8 as. to Rs. 2 per maund, but are not so large as they might be.

"I want a few tubers, Jerusalem artichokes, too, as a beginning here,—and the best yams to be got, those large flowery white West India ones, gigantic in size, will be the thing. The seed wheat, too, you will let me know about; we want a kind not subject to rot, or mildew, for this foggy dewy misty country: and when the maize and tobacco come from America do not forget me.

SUDDYAH, UPPER ASSAM:

March 28th, 1857.

"I lately got your kind letter, for which my best thanks. You are indeed very attentive to my numerous demands, and I feel great satisfaction in trying to send you any novelties in the vegetation of this remote country. At present there seems a great and unseasonable dearth of flowers, nothing to be seen beyond *Asclepias curassavica*, *Morinda tinctoria*, *Mussaenda pubescens* (?) a minute *Gesnera* (a pretty violet colour), and some coarse timber trees, with their unornamental inflorescence. But I think our Suddyah forests are naturally very poor in flora, compared with Muttuck on the other bank; our orchids, too, though very rich of their kind, are few in variety. The other day I had occasion, on the duty of exploring the line of a future road, to break through a most ancient and savage forest, the trees of which for several acres might be said to be literally devoured by vegetable parasites; most of these orchids were just out of bloom, so I missed the delight of seeing and smelling such a wilderness of beauty. I noticed several very fine specimens of a fine pendulous plant, forming such a glossy, green mass on the bark of the trees it adheres to. I sent you a specimen with the orchids, but it is just possible it withered up, and you did not notice it.

"I am sending you a small box, shortly, containing: 1st, a small bottle of the vinous extract of *Mishmee teeta*, which I find so fine a tonic and restorative of the digestive powers,—especially when exhibited in the *sequelæ* of Indian fevers. It is prepared by pouring a bottle of the best sherry wine over four ounces of the root of the *Mishmee teeta* (previously well washed in two or three waters, and then bruised), a small quantity of the peel of bitter orange, and a few spices, to impart a pleasant aroma, are added, and the whole left to stand in a closed jar for a month, in a warm, but shady place; the liquor is then to be filtered off through blotting paper, and is ready for use. One teaspoonful to a small glass of any wine or plain water may be taken

three times a day, and will, as might be expected, create a great appetite and sense of warmth in the stomach.

"Secondly, I send you specimens of indigenous sarsaparilla, just received from Sylhet, and which also, from enquiries hereabouts, seems to have a habitat in all the low hills of our N. E. Frontier—query, is this *Smilax glabra*, the present *chob-chenee* of our Indian bazars, and which I found in the extreme N. W. Provinces as far as Goolab Singh's territories? With the hakeems in Cashmere, who are considered among the best of our Eastern physicians, I also found it in abundance, and saw a patient who had come all the way from Delhi to undergo a course of the drug. The Asiatics use it as a purifier of the blood in the form of decoction for the same disorders as our European practitioners.

"Thirdly, I send a small quantity of the cottony down of the arboreous *Asclepiad*, with scarlet fleshy flowers, of which I some time ago sent you a small packet erroneously marked *Cryptostegia*. I had not then seen the tree in flower, and went by the near resemblance of the leaves and ripe follicles; it seems a delicate glossy product, which might rival the *muddâr* in Bengal. *Asclepias curassavica* grows in great abundance, too, in some of our jungles, and bears a great deal of similar silky down.

"Fourthly, I send you a small original packet of the natural tinder of Assam, being the spongy substance found between the fibres of "*Caryota urens*,"—that handsome palm of which I fancy your garden has an abundance; the flower shoot is a much coveted article of food, and the tree dies by its removal, hence it seems rather scarce hereabouts. I hope the ferns, *Hedychiums*, &c., have reached you all alive and flourishing.

"For a high opinion of *Mishmee teeta* "vide O'Shaughnessy's book,—and strange that those three very remarkable Alpine *Ranunculaceæ*—*Aconitum ferox*, *A. heterophyllum*, and *Coptis teeta*, are all to be found in such abundance on our Indian mountains. What a mine of medicine still probably remains undiscovered!

"I was very sorry to hear of the "*petroleum* disaster,—shall I send you more? It is wonderfully useful, white ants, and every other insect, abhor it, and it seems that even mice will not touch corn rubbed with it,—and *fungi* do not seem to like it either; but, as it evaporates by exposure to the air, the mere application to timber would not suffice. I believe it is an excellent solvent of caoutchouc, and hence an ingredient in that most desirable substance for mechanical employment in India, "marine glue." I dare say more virtues lie hidden in it than we are aware of. I had nearly forgotten to say,

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that, as an application in all cutaneous disorders of man or beast, it is most efficacious, and often removes acute rheumatism by its penetrating heating qualities. The native physicians, who call it "*muttee-ke-tél*" (*earth-oil*) have been for ages aware of its valuable properties. Assam could probably compete with Burmah and Arracan, in furnishing the raw product, for we have numerous springs."

SUDDYAH, UPPER ASSAM:

June 7th, 1857.

"I have added to my former list of natural products, since I last wrote, some root and dried specimen of the valuable Assamese medicine *Chanda teeta*, (looks as if it belonged to *Cinchonaceæ*?) a most intense bitter, not unpleasant to the taste as *Mishmee teeta*, but evidently possessing more active principle. Use, infallible in the worst cutaneous disorders, externally, and a specific in the numerous severe bowel complaints to which the natives of Assam, from their dirty habits and bad food, seem peculiarly liable. (I must tell you that the hill tribes employ *Mishmee teeta* in the same manner, externally, for itch, and all the other foul skin diseases produced by filthy habits.) The plant called *Chanda teeta* seems to be no where very common. I never saw it cultivated, and I have known a man in search of the medicine go a great many miles without finding it; it usually grows in level grassy places on the edges of the jungle, and is a pretty little under-shrub, two or three feet high, (seldom so much) with delicate erect cymes of small rose-coloured flowers, few in number. I have marked two or three fine specimens to send you in the proper season.

I have not yet been able to procure a portion of the root of that *Asclepiad* of which the silky down is forwarded. I have also heard of a climbing *Asclepiad* with a bitter root, said to possess all kinds of wonderful virtues, and called in Assamese *Nanyal teeta*;—it is said to be scarce about Suddyah, but a man who is hunting for it still expects to find it."

June 17th, 1857.

"I had hoped this year to have astonished the ryots of Suddyah with some fine field crops: and had a good piece of land all ready for the purpose, Government having granted great facilities to introduce cultivation, in sanctioning plough bullocks, coolies, and a sum of money for clearing the jungles. As a farming and horticultural locality I consider Suddyah unmatched (as I have before told you) for the growth of successive and surface crops, and indeed root crops, when the waste lands have been well ploughed and opened, but tea, coffee, and tropical fruit trees in general languish, and die there, the sand being too deep, while

Vanilla flourishes in those ancient moss grown forests which the Burrumpooter has spared. I have a small piece of mustard cultivation on some newly-ploughed ground in the Suddyah cantonment, to test the efficacy of this plant in killing the indigenous jungle, a virtue which the natives say it possesses, from the acrid juices contained in the roots. Mustard is partially grown by the zemindars of Suddyah for the sake of the oil, and the surplus is bought by the wide-awake Marwarrie trader for transmission to Dacca, where it commands a high price. The soil of Debrooghur is a gritty loamy clay, in which both tea and coffee attain great perfection, as you are aware, and in which a multitude of other products, including the far-famed *Rheea*, attain great perfection. In your next dispatch of plants I shall feel greatly obliged by your sending me the plants of *Theobroma Cacao*, any Chinese fruits, and useful plants, ornamental trees, &c., also country fruits, as alligator pears, plums, &c., &c.; the former would not grow at Suddyah, but I have no doubt of their doing so at Deebroo, in well tilled soil and shade.

"I want as many *Vanilla* plants as you may be kind enough to bestow, two or three young vines of sorts will be also acceptable, though people discourage me regarding them, and say they never bear fruit in so moist a climate. I will bud them, or graft them on our wild one, and try that. What with no steamers, and no time, I have no opportunity of foraging for plants and seeds, but I have a fine plank of cedar from the far, far unknown sources of the Burrumpooter (drifted) as a specimen for your museum; a tree or two like that would be a gift fit for an emperor. Some day I may in my travels discover the forest, and then will set up a circular saw mill on the spot. What may be the market value of cedar wood?

"Our rivers are casting up gold this year at a harvest rate. I know of one party washing daily 2 tolah weight, and they got the stream for Rs. 33. All these riches of the earth, both vegetable and mineral, are, I suppose, the great means by which at no very distant period of time this remote region will be sought out and colonised as California and Australia have been; the sooner the better, for the stability of our power, and the subversion of Hindu and Moslem barbarism.

"I am getting my experimental farm here into ploughing order, and rely wholly upon your contributions from time to time, both in trees and agricultural seeds for covering its surface. As I told you once before, I think, there is no province in the empire where there is less advancement in husbandry, and more need of energetic and experimental introductions."

DEBROOGHUR:

November 29th, 1857.

CHEMICAL INVESTIGATION OF THE COTTON PLANT.

(Communicated by the Board of Revenue, Lower Provinces.)

To the SECRETARY OF THE AGRICULTURAL SOCIETY.

SIR,—I am directed by the Board of Revenue to forward the accompanying copy of a memo., furnished to the Honourable Court of Directors by Dr. Mallet, Professor of Chemistry in the University of Alabama, U. S., of specimens of cotton, and information regarding cotton plants desired by him, and to solicit the aid of the Agricultural Society generally, and its members individually, in procuring the information sought by Dr. Mallet.

Yours, &c.,

E. T. TREVOR,

FORT WILLIAM:

October 9th, 1857.

Secretary.

Specimens of Cotton and information desired with a view to the Chemical Investigation of the Plant.

It would be desirable to have specimens from four or five of the cotton growing localities of India, differing in soil and climate; those which are most important now, or may be expected hereafter to become so.

Separate analyses should be made of the ash of the following parts of the plant, and specimens will therefore be required of—

(1st.) The root.

(2nd.) The stem (with smaller branches and twigs.)

(3rd.) The leaves.

(4th.) The bole or pod.

(5th.) The seed.

(6th.) The fibre or cotton.

About four pounds of each of these parts (in the green state), would be needed, hence a sufficient number of entire plants should be collected to yield at least the above amount of each part.

The total weight of the entire plants clear of earth, and in their fresh green state, must be stated; they must be weighed free from rain or extraneous moisture.

The specimens should be gathered in dry weather, and just after the bole has fully opened.

The whole of the root, as of every other organ should be taken, each specimen should then be put up in paper or cotton cloth and distinctly marked and referred to a list, the marks legible and indelible.

Composition of Cotton-seed cake.

Besides the plants, about four pound weight of the soil in which they were grown should be also put up in cotton cloth, and similarly labelled, carefully referring to the plants taken therefrom.

Information as to the following points accompanying the specimens would be very important and valuable.

(1st.) Nature and depth of the soil as to dryness or moisture retentiveness; what other crops are grown in it; is it deemed very fertile; any special weeds?

(2nd.) Geological and topographical character of the district; nature of underlying rock; level above the sea; well or ill-drained naturally?

(3rd.) Climate (especially as regards rains, their amount, and the seasons at which they fall; is irrigation employed, when and how long in the year?

4th. Kind of seed used, and whence obtained?

5th. General character of plant; whether herbaceous or tree cotton?

6th. Average height of plant and spread of branches; distances from plant to plant?

7th. Average spread of roots, in depth and laterally?

8th. Mode of cultivation; time of planting; distance at which plants are placed apart; amount of labour bestowed upon weeding during growth time; of flowering time; of picking duration; of picking, &c.; weight of "ginned" cotton fibre produced per acre; weight produced per hand employed?

9th. Manure used, if any cotton seed returned to the soil; stalks allowed to decay on the field?

10th. Diseases or ravages of insects to which the plant is subject?

Some samples of the "ginned" cotton ready for market might be useful, as affording, by comparison with the raw fibre, an idea of the degree of care with which the seed is separated. The value of the fibre depends to a very great extent upon the attention given to this mechanical preparation.

*Composition of Cotton and Niger-seed cake: By Professor ANDERSON,
Chemist to the Highland and Agricultural Society of Scotland.*

In the year 1850 I brought under the notice of the Highland Society the first specimen of cotton-seed cake seen in this country, which was manufactured as a matter of experiment for Mr. Burn, C. E., who had contrived a machine for cleaning cotton. It was part of his plan to import the cotton containing the seeds into this country, and to make the seed an article of commerce, by extracting from it the oil, and vending the cake: but although this plan was not carried out, Mr. Burn's

Composition of Cotton-seed cake.

observations appear to have attracted the attention of cotton-growers, for a quantity of cotton-cake was imported into Liverpool a couple of years after, and was used in Cheshire for feeding purposes. Since that time it has become a regular article of import, although its consumption in Scotland, at least, has been very small until the present year. The analysis which I published some years since in the *Transactions of the Society* being that of a special sample, it may be of interest for me to communicate the results of two others of the ordinary manufactured article.

Water,	11.90	14.20
Oil,	5.08	9.83
Albuminous compounds, ..	21.92	18.21
Fibre, mucilage, &c., ..	54.52	47.54
Ash,	6.58	10.22
	<hr/>	<hr/>
	100.00	100.00
Nitrogen,	3.49	2.90
The ash contained —		
Earthy phosphates,	4.65	4.57
Phosphoric acid, combined with the alkalies,	1.05	0.54

These numbers are sufficient to satisfy any one that cotton-cake is likely to prove a useful and convenient addition to the list of our cattle foods, although it is by no means comparable to linseed-oil cake, or even to rape and poppy cakes. A reference to the detailed analyses of many different varieties of the latter substances contained in the *Transactions* for 1852 and 1853, will leave no doubt upon this point. In fact, whether we take the oil or the nitrogen as the standard by which to estimate their relative values, we find that the balance is greatly in favour of oil-cake. The usual quantity of nitrogen in linseed-cake is about 4.5 per cent; and it rarely, even in inferior samples, falls much below 4; while in the one cotton-cake it is 3.5, and in the other only 2.9; giving 3.18 as the mean. So likewise oil-cake contains in general about 10 or 12 per cent of oil, while the average of the two cotton-cakes is only 7.45. In one particular instance I have examined a sample of cotton-cake containing upwards of 20 per cent of oil; but this was obviously quite an exceptional case, for the cake was entirely different in appearance from the others, and had scarcely been pressed at all, as it was so soft as to crumble down between the hands.

If, then, we take the two samples of which I have given the analysis, as fair average cotton-cakes, it is quite obvious that they must be

considered decidedly inferior to oil-cake; and this is practically acknowledged by the lower price at which it is sold, although it may be doubted whether the difference is sufficiently great. At the present moment cotton-cake is quoted in the lists at £8-10s. per ton, while Baltic oil-cakes are from £3-10s. to £9-10s.; and we believe there is no one who would hesitate to give an extra pound per ton for oil-cake, even though it may not be of the very best quality. The proper valuation of cotton-cake is a matter of some importance, as it seems likely to become an article of considerable trade. Its production has been hitherto impeded by the inferiority of the oil expressed from the seeds, which is very dark-coloured, and occasionally almost black; but a process by which the impurities are removed, and the oil obtained of a beautiful amber colour, and well adapted both for burning and lubricating, has recently been contrived, and it may be fairly expected that its manufacture will receive a very material extension.

Composition of Niger Cake.

A kind of cake is sold under this name in considerable quantity. I have been unable to ascertain from what seed it is obtained,* but it seems to merit the attention of feeders, as its composition indicates for it a high value; and if palatable to the cattle, it might be used with great economy, its price being considerably lower than that of oil-cake.

Its composition is—

Water,	..	..	..	..	..	10.70
Oil,	7.46
Albuminous compounds,	30.64
Fibre, mucilage, &c.,	41.98
Ash,	9.22

Nitrogen,	4.88
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The ash contains—

Phosphates,	2.77
Phosphoric acid in the Alkaline salts,	1.19

If the proportion of albuminous compounds be here taken as the measure of the value of this cake, it must stand on a very high level, and fully equal in feeding value to linseed-oil cake of the best

* It is obtained from the seed of *Verbesina sativa*, Roxb: *Guisotia Abyssinica*, Cass: It is known on this side of India under the names "Ram-til" and "Sirgoofa." It is also cultivated in Western India, and known there as "*Kalee-til*." The oil obtained from this seed is used by the poorer classes in various parts of India as a substitute for *ghes* (clarified butter). For some interesting particulars regarding this useful plant, see *Journal A. and H. Society of India*, Vol. VII. p. 40. and Vol. VIII. page 61.—*Eng. Journal, A. and H. S.*

Destruction of the Gutta^{}Percha Trees at Singapore. 19*

quality. The oil, no doubt, is under the quantity usually found in the latter, but its deficiency is more than counterbalanced by the larger quantity of albuminous compounds, which are also the most important nutritive constituents of all kinds of food. Without placing too much reliance on a single analysis, which may not give a fair representation of the average quality of niger cake, the results now given ought to direct the attention of feeders to this article; and any one who has experience of its practical use would do a benefit to agriculture by making it public.—*Journal of the H. and A. Society of Scotland, January, 1858.*

Destruction of the GUTTA PERCHA Trees at Singapore.

A valued friend and correspondent, a mercantile gentleman in Singapore (Charles Wilson, Esq.), has given us the following interesting particulars relative to the destruction of the trees of Gutta Percha (*Isonandra Gutta*) in that island:—

“Your letter of the 3rd October reached me by last mail, and I assure you it will give me much pleasure if I can be of use to you in any way out here, either in collecting any information you may require about our vegetable substances in Singapore and the neighbouring countries, or in procuring specimens of them for your museum as Kew.

“I have commenced to collect all the different Guttas that are brought to Singapore in the Malay and Bugis prahus, and when I have succeeded in procuring specimens of the principal part of them, I will send them to you.

“May of those passing under different names however are merely different qualities of the same stuff, or prepared in a different manner. Seeds of the Gutta Percha tree, and flowering specimens of the plant, I am afraid I shall not be able to procure in Singapore, as we have nothing but very small trees left in the island now; all those old enough to yield even a very small quantity of sap having been cut down by the Malays; but Sir James Brooke, who has been staying here, has promised to send me both from Sarawak, where there is no difficulty in procuring them, there being abundance of full-grown trees still.*

* The Brone Gutta Percha, we believe, is much less esteemed than that of Singapore, and from specimens of the leaves that have been sent us by Sir James Brooke, it would appear that the species is different from the true Gutta Percha. The veritable *Isonandra Gutta* has however recently been detected in Sumatra, and a specimen has been sent to us by our excellent friend Professor De Vriese, of Leyden.—ED.

14 *Destruction of the Gutta Percha Trees at Singapore.*

The trees are always cut down here to procure the sap, though I have no doubt it is very bad policy to do so, since by tapping them a good quantity of sap easily runs, and it might be repeated again after giving the trees a reasonable time to recover. Natives will never consider any future advantage, their great object being to get the largest quantity at a time. Their argument, too, that unless the trees were private property, and could be looked after, it would be impossible to protect them from one's neighbours, is very true; and this would be quite out of the question in the extensive forests where the Gutta trees are found. At some future period, I have no doubt the Gutta Percha tree will be quite extirpated in all the countries about Singapore. Being always cut before it has a chance of seedling, it cannot continue to exist unless the price rises, to such an extent as make it worth while planting the tree on private property.

"It is to be found" (the identical species?) "over nearly the whole Archipelago that is inhabited by the Malay race, but as far as I know does not extend further to the east. True Gutta Percha is called *Guttu Tabbon*; most of the other Guttas are varieties of Caoutchouc. Neither the Malays nor the Chinese make much use of Gutta Percha as far as I have seen. Knife handles and small buckets seems to be the principal uses they put it to; it is sometimes made into bands for tying things with also, but I have not often seen it used in this way.

"The quantity of Gutta Percha exported from Singapore in 1855 was about 1,200 tons but this year it will be much short of that amount, probably not over 1,500 tons. Its present price is 22 dollars per picul (133½ lbs.) for good quality."—*Hooker's Journal of Botany for August, 1857.*

Monthly Proceedings of the Society.

(Wednesday, the 14th January, 1857.)

(ANNIVERSARY AND ORDINARY GENERAL MEETING.)

Rajah Pertap Chunder Sing, Bahadoor, Vice-President, in the chair.

Read a letter from the President, expressing his regret that public business would prevent his attending the Meeting.

The proceedings of the last monthly general meeting were confirmed. The Secretary read a letter to his address from Mr. W. Haworth, requesting that his name might be removed from amongst the Members of the Council and from the various Committees in which he has taken part, in consequence of his not having the necessary time to devote to the duties connected with them. "I regret much"—adds Mr. Haworth—"that I have to take this step, as I feel great interest for the welfare of the Society, and it would have given me great pleasure to have taken an active part in its affairs, but I feel that I should not be in a position to do my duty, if I continued to hold the various appointments as heretofore."

The meeting then proceeded to the election of Officers and Council for the current year, and Messrs. Longueville Clarke and Walter Landale having been appointed Scrutineers, reported the result to be as follows :—

President.—The Hon'ble Sir Arthur Buller.

Vice-Presidents.—Mr. A. Grote, Rajah Pertap Chunder Sing, Bahadoor, Dr. Thomas Thomson, and Baboo Peary Chand Mittra.

Secretary.—Mr. A. H. Blechynden.

Council.—Mr. C. A. Cantor, Mr. S. Douglas, Baboo Shib Chunder Deb, Mr. B. Warwick, Mr. J. Church, Baboo Gobind Chunder Sen, Mr. J. Agabeg, Mr. S. P. Griffiths, Mr. W. G. Rose, Baboo Ramgopal Ghose, the Rev. James Long, and Mr. S. H. Robinson.

The revision of the Standing Committees was next entered on, and the names of the following members were added to the Committees in which there were vacancies ; namely to the Committees for Sugar, Fibres, Grain, Oils, and Implements of Husbandry and Machinery ; Messrs. S. H. Robinson, J. Cowell, Peary Chand Mittra, C. B. Wood, and H. Mornay respectively, in the room of Mr. W. Haworth ; Mr. R. Eames was also added to the last named Committee in the place of Colonel H. Fraser ; and Mr. C. A. Cantor, to the House Committee, in the room of Mr. Staunton, resigned.

The Annual Report from the Council was next submitted. It announces the continued prosperity of the Society, that the number of Members elected during 1856 was 109, exceeding any year, except 1851, for the last 15 years ; that

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the total number on the list was 707, from which deducting Honorary, Corresponding and Associate Members, and those absent from India, leaves 565 as the actual number of paying members at the close of the year, or 27 more than in 1855.

The report alludes to the satisfactory financial condition of the Society. The total-receipts during the year are Rs. 30,449 and disbursements Rs. 29,236. The liabilities amount to Rs. 5,659 and the dependencies to Rs. 8,787.

On the motion of Mr. L. Clarke, seconded by Mr. Peter McArthur, it was *resolved* that the report be received and adopted.

The business of the ordinary monthly meeting was then proceeded with, and the following gentlemen who were proposed at the meeting in December were duly elected members, viz : Dr. D. McL. Falconer, Baboo Ramanauth Gossain, Captain C. W. Miles, Mr. J. A. Charriol, Captain C. Burbank, Mr. L. B. Oliva, Baboo Omachurn Mitter, Dr. Brandis, Aga Syud Hossein Shoostree, and Dr. E. C. Thorp.

The names of the following gentlemen were submitted as candidates for election :—

J. A. Crawford, Esq., C. S. ;—proposed by Mr. S. Douglas, seconded by Mr. W. Stalkartt.

Charles A. Cave, Esq., Konah factory, Purneah ;—proposed by Mr. E. Mackintosh, seconded by the Secretary.

E. F. Florest, Esq., Allumchand, Allahabad ;—proposed by the Secretary, seconded by Baboo P. C. Mittra.

Baboo Mudden Mohun Thakoor, Bhaugulpore ;—proposed by Mr. Walter Landale, seconded by Mr. Thomas Grant.

P. T. Onraet, Esq., of Bhaugulpore ;—proposed by Mr. Landale, seconded by Mr. Grant.

A. J. Camaratta, Esq., Merchant, Ummeerapoorah ;—proposed by Mr. Joseph Agabeg, seconded by Baboo P. C. Mittra.

C. J. Pittar, Esq., of Calcutta ;—proposed by Mr. F. Jennings, seconded by the Secretary.

Baboo Issurchunder Sing ;—proposed by Baboo P. C. Mittra, seconded by Rajah Pertaup Chunder Sing.

The following contributions to the Library, Garden and Museum were announced :—

1. Selections from the Records of the Government of India, Nos. 13, 14, 16, 17, and 18, Selections from the Records of the Government of Madras, No. 32, Journal of the Indian Archipelago, Nos. 10 to 12, Vol. 9, and No. 1, New Series. *Presented by the Government of Bengal.*

2. Half-yearly Report of the Committee of the Bengal Chamber of Commerce. *Presented by the Chamber.*

3. Notes on the Herbarium of the Calcutta Botanic Garden. Presented by Dr. Thomson.

4. A small assortment of seeds, and Orchids from Upper Assam; also oil from the seed of *Messua ferrea*. Presented by Captain W. H. Lowther.

5. Three packets of Australian vegetable seeds from Melbourne. Presented by Mr. R. Scott, of the H. C. Botanic Garden.

6. Samples of fibre from the "Dheroos" (*Hibiscus esculentus*) and from *Hibiscus Abelmoschus*, prepared at Khalboalya factory, Kishnaghur. Presented by Mr. M. Tweedie.

7. Samples of 4 kinds of fibres from the Punjab. Presented by Mr. H. Cope, namely:—

No. 1, Sample is the fibre of *Urtica heterophylla*, which yields the nettle fibre of the hills about Kangra: the seed is said to yield from 18 to 20 per cent. of a superior burning oil.

No. 2, Sample of "Sunn" (*Crotalaria juncea*) grown near Shalimar, in the neighbourhood of Lahore, in the low Khadir lands, during the year 1856, by order of the Fibre Committee.

No. 3, Sample of "Sun okra" (*Hibiscus cannabinus*) from plants grown in the same locality.

No. 4, Sample of Hemp (*Cannabis sativa*) grown at Dhurumkote, near Kangra, during the rainy season of 1856, by order of the Fibre Committee.

8. Samples of his seamless gunny bags. Presented by Mr. G. A. DePanning.

9. Two specimens, unrefined and refined, of oil from the seed of the "China Korofee" (*Cerbera Thevetia*). Presented by Mr. C. B. Wood.

10. An excellent sample of coffee, the produce of plants raised in the Barrackpore Park. Presented by the Superintendent, Mr. C. Sharp.

The recommendation from the Council, that the sum of One Thousand Rupees be placed at the disposal of the Garden Committee for the purposes set forth in their report which was submitted at the last meeting; and that an increase of hands be granted to the garden establishment, to the extent of Rs. 50 per mensem,—was brought up for disposal: whereupon it was moved by Mr. L. Clarke, and seconded by Baboo Shibchunder Deb, and resolved, that the recommendation of the Council be adopted.

Another recommendation was also submitted by the Council, for disposal at the next meeting, namely, that an additional sum of Rs. 15 per mensem be granted for increase of pay from the commencement of the year, to three of the writers in the Secretary's department.

The Council further recommended that the first show of the season be held in the Auckland Garden on Wednesday, the 28th January; the second on Thursday, the 5th of March; and the third in the Town Hall on Wednesday, the 1st of April. Agreed to.

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The Gardener's monthly report was read. Mr. McMurray states that the usual quantity of peas of 13 kinds have been sown, of which the majority are doing well, and will, from present appearance, yield an abundance of seed. "Among these kinds there is one sort deserving particular notice from its early habit, that is Carter's Daniel O'Rourke pea, which was sown on the 8th November, and on the 28th of the same month produced flower, from which there was, on the 16th December, the young crop of peas fit for picking for table use, making a total of 35 days from the time of sowing to the time of being fit for the table. The crop is now ripe, as will be seen from the muster forwarded for laying before the present meeting, and there is every reason to believe that there can be a second crop raised from the same seed this season, which I intend to try, and will report the result to the Society hereafter.

The crop of sugar-cane which has been growing four years upon the same ground is now fit for cutting. The canes are not very large, owing to their remaining so long on one plot, at the same time they are very good for forming a young plantation, where such a crop is required, and as I purpose removing the whole, and having the ground trenched, I would suggest that the Society dispose of the whole at 1-8 annas per 100, after a sufficient quantity has been put down for garden stock in a new plot of ground."

The Gardener closes his report with notices of several contributions to the garden, including plants of the *Araucaria imbricata* and *Phulcenopsis amabilis* from Mr. C. B. Stewart, and a plant of *Brunsfelsia erecta* from Mr. R. Wood.

Mr. McMurray adds his calendar of operations for the present and beginning of the ensuing month :—

"In the Flower garden and Conservatory get all kinds of plants requiring more pot room shifted as soon as circumstances will allow, in order that they may be well established before the hot weather sets in ; and see that all kinds under cultivation in pots are not allowed to get too dry at the root, as at this time they are apt to do where attention is not paid, which can soon be found out from the want of substance, and the sickly appearance of the foliage and flowers.

"Camellia plants are apt to shed their flower-buds at this time, when exposed to the dew at night and sun during the day, cold blasts, and the want of water at the roots ; when such plants are cultivated, it would be advisable to guard against such occurrences, otherwise the success of obtaining a healthy expansion of the bloom, is nothing but a mere chance, and over-watering these plants at the root is equally as bad, and causes the flowers to drop off.

"Where deciduous plants have to be shifted, there should be no time lost in forwarding this work, as the spring growth will soon commence, after which the same success need not be expected as when the sap of the plant is in a dormant state. Look over the rose beds frequently, and remove all decayed flowers, and when stocks are ready, budding should be commenced.

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“Continue the propagation of all kinds of soft-wooded plants, such as geraniums, verbenas, clove pink, &c., &c., for next year's stock, as during the hot and rainy season this work cannot be carried out with the same certainty of success as at the present time. Put down rose cuttings and other such wooded plants in beds in a shaded place, where they will strike freely, and make nice plants for lifting for any purpose of culture about the commencement of the rains. Let no plant suffer at this time for the want of water, and where it is considered necessary, use liquid manure occasionally, which will throw a vigour of growth and freshness into the whole plant, that otherwise cannot be expected. The stagnant water in some localities about Calcutta is capital for this purpose, but care must be taken that it is not too strong for the plants to which it may be applied; should such be deemed the case, the proper consistency can be made by adding pure water to it.

“*In the Orchard and Kitchen garden*, where the peach trees and vine plants have not already been pruned, no time should be lost in forwarding this work, as the sap will soon be in circulation, after which bleeding is sure to take place where this work is too long left undone. The peach trees should be well headed in, and all useless young and decayed wood cut away, which otherwise will encumber the plant, and prevent a healthy young growth taking place, which is necessary, not only for the encouragement of the present crop of fruit, but the production of bearing wood for next year.

“The vines at this time should also be cut back to within three or four eyes of last year's growth.

“The season is too far advanced to sow the majority of vegetable seeds with much prospect of success: still where knole-kole, cabbages, lettuce, &c., have been raised in beds, they should be planted out at once on well prepared ground, the different kinds of cucumbers, melons, squashes, vegetable marrow, &c., ought to be sown at this time.

“Lift yams where not already done, and get the ground prepared for other crops. Arrowroot and tapioca bulbs should also be taken up, and the powder prepared.

“Attend to former directions, and keep the whole of the grounds clear of leaves, and in a neat and tidy condition.”

In connection with the above, the Secretary submitted letters from Mr. Betts, Honorary Superintendent of the public garden at Berhampore, Mr. Sharp of the Barrackpore Park, and Mr. Scott of the H. C. Botanic Garden, reporting the result sowings of several descriptions of seeds. Mr. Betts gives a favorable report on the flower seeds from Messrs. Rollisson. Mr. Sharp also states that they have proved much better than those received from Messrs. Carter and Co., while the vegetable seeds from Ootacamund have turned out a complete failure. Mr. Scott submits comparative statements of trial sowings of Cape, American, and Scotch vegetable seeds, and offers some interesting remarks thereon. These reports were referred to the Garden Committee.

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Communications on various subjects.

The following letters were also read :—

1. From the Right Hon'ble Sir Lawrence Peel, Isle of Wight, dated 16th December, 1856, in reply to the reference made to him on the subject of the Society's application to the Hon'ble the Court of Directors for an additional pecuniary grant. "You will see by the enclosed"—writes Sir Lawrence—"though probably you know it already, that the Hon'ble the Court of Directors have increased their allowance to the Society, and thereby shewn liberality and sense. You will see also that I did my duty to the Society in backing the application, though I do not suppose that that at all influenced the decision. I am intending to send out some musters of improved flower-pots, which may perhaps answer in India. Pray command my services at all times in aid of the Society."

The following is the letter from the Secretary of the Court, dated 10th October, 1856 :—

"I have laid before the Court of Directors of the East India Company your letter dated 29th ultimo, forwarding a letter from the Secretary to the Agricultural and Horticultural Society of India, applying for further pecuniary assistance from the Court towards the Society's operations, and supporting the application by your own testimony to their value.

"In reply, I am commanded to inform you, that the application of the Agricultural and Horticultural Society, with which you have been so long and so beneficially connected, had previously been brought before the Court by the Government of India, and that the Court's authority has been given for the enlargement of the annual payments by Government towards the objects of the Society from Rs. 2,620 to Rs. 5,000 per annum."

Moved by Mr. L. Clarke, seconded by Mr. Cantor, and carried by acclamation, that the best acknowledgments of the Society be tendered to the Right Honorable Sir Lawrence Peel, for the interest he has taken in the above matter, and for the further offer of his valuable services.

2. From the Secretary, Government of Bengal, intimating the compliance of the Lieutenant-Governor with the Society's request for free transmission by steamer of cases of plants to and from Upper Assam.

3. From H. Cope, Esq., suggesting a cheap and simple mode of preserving seeds from moisture during a long voyage. Referred to the Garden Committee.

4. From Messrs. Gillanders, Arbuthnot and Co., forwarding on behalf of the Hon'ble Walter Elliot, of the Madras Civil Service, a quantity of gum of *Euphorbia Catechu*, to compete for the prize offered by the Society for an efficient substitute for gutta-percha.

5. From C. Gubbins, Esq., dated 24th December, acknowledging receipt of copy of report of the Dundee Chamber of Commerce on the flax straw raised at Allypore, and forwarded by him to the Society in 1855. Mr. Gubbins remarks, "I consider the report extremely favorable, and the more so, as I find the

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acclimated seed of last year's growth is succeeding most admirably? the plants (which have come up very thick and even,) are already of an average height."

6. From G. W. Hemming, Esq., Oorai, dated 28th December, conveying his best acknowledgments to the Society for the resolution passed at the last meeting on the subject of "Atees," and enclosing copy of another letter from Dr. Balfour of Delhi, intimating that the drug will be brought prominently before the Medical Board. Dr. Balfour adds,—“Dr. Row sent my report to the Superintending Surgeon of Umballah, who put the case into the hands of Dr. Butt of Looddeeah; he found “Atees” in the bazar there brought down from the hills, and at a reasonable rate. It has been found to answer wonderfully, and all the papers are to be sent up.”

7. From Lieutenant R. Stewart, a few items of information regarding tea planting in Cachar :—“The tea gardens here are getting on very well—several hundreds of acres have been cleared and planted, and some of last year's seedlings are already three feet in height—others again are weak and sickly, and not over a few inches above the ground; this disparity arises, it is supposed, from the poorness of the seed, or of that portion of it which has produced the weak plants; the seed is a very delicate one, and soon feels the exposure to the air, and the kernel begins to dry up and shrivel; put in in this state, but small germinating power remains, and the plant produced is sickly, and unable to bear the sun.

“Transplanting small indigenous plants from the jungle into the gardens, does not appear to have succeeded well; many of the plants had not been more than a few months above ground, and that too in the shade of a dense forest, they were not therefore able to stand the change: plants of a year's growth or two can be safely transplanted.”

(Wednesday, the 11th of February, 1857.)

The Hon'ble Sir Arthur Buller, President, in the chair.

The proceedings of the Anniversary Meeting were read and confirmed.

The gentlemen proposed at the last Meeting were elected members, viz :—

Messrs. J. A. Crawford; C. A. Cave; E. F. Flouest; P. T. Onraet; A. J. Camaratta; C. J. Pittar; Baboo Mudden Mohun Thakoor; and Baboo Issur Chunder Sing.

The names of the following gentlemen were submitted as candidates for election :—

Major R. Strachey, Engineers, Calcutta;—proposed by Sir Arthur Buller, seconded by Dr. Thomson.

R. Berkeley, Esq., Assistant-Commissioner, Lahore;—proposed by the Secretary, seconded by Mr. W. G. Rose.

Mr. W. Willocks, Deputy-Superintendent, Eastern Jumna Canals;—proposed by Dr. Thomson, seconded by Mr. C. A. Cantor.

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The following contributions were announced :—

1. Selections from the Records of the Government of India, No. 19. *Presented by the Government of Bengal.*
2. Memoirs of the Geological Survey of India, Vol. I. Part I. *Presented by the Government of India.*
3. Journal of the Society of Arts of London, Vol. 4. *Presented by the Society.*
4. Journal of the Asiatic Society of Bengal, Nos. 6 and 7 of 1856. *Presented by the Society.*
5. Directory and Calendar for the N. W. P. and Punjab; and the Almanac and Companion for the N. W. P. and Punjab. *Presented by Mr. W. H. Carey.*
6. Report of the Calcutta Public Library for 1856. *Presented by the Curators.*
7. A further supply of the bark of *Daphne mucronata*, for experiment as a material for the manufacture of a fine description of paper. *Presented by Captain D. Briggs.*
8. Specimens of cocoons of mulberry worm, the result of cross-breeding between the annual worm of Europe and the monthly worm of Bengal. *Presented by F. Bashford, Esq.*
9. An excellent specimen of the tuber of the Chinese potato (*Dioscorea Bata-tas*.) *Presented by Baboo Nobinchunder Doss, Secretary Local Committee, Public Instruction, Baraset.* This tuber was raised, with several others, in the Baraset garden, from stock supplied by the Society in December, 1855.
10. Seed of the Chinese rice paper plant (*Aralia papyrifera*) from the Society's Garden.

The motion of which notice was given at the last meeting, "that an additional sum of Rs. 15 per mensem be granted for increase of pay from the commencement of the year, to three of the writers in the Secretary's office," was duly submitted and carried.

Provision of Vegetable, Flower, and Agricultural Seeds for 1857.

Read the following report of the Garden Committee on the above subject:—

"Your Committee having taken into consideration the subject of the provision of seeds for 1857, have to report as follows:—

"*Vegetable, Cotton, Tobacco and Maize seeds from North America.* It was recommended by the Council in November last, that a consignment, similar to that of 1856, be again ordered for the next season; and, this recommendation having been adopted by the General Meeting, an order was transmitted by the Overland Mail of 22nd November to the extent of \$1,250. The attention of the seedsmen was called to the fact, that a portion of the peas and beans included in their last consignment was altogether of inferior quality, and not sufficiently well ripened and dried; further, that some of the papers, especially the cauliflower and artichoke, did not contain a sufficient quantity of seed for sowing in a moderate size garden.

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"Vegetable Seeds from the Cape.—The reports furnished by Mr. R. Scott, Head-Gardener, H. C. Botanic Garden, Mr. C. Sharp, Superintendent of the Barrack-pore Park Garden, and by the Society's Gardener, being altogether favorable, as respects the germination of the seeds forwarded last year by Messrs. Villet and Son, the Committee recommend that another similar order be given them. Messrs. Villet should, however, be instructed to send a better description of 'White French Bean' than the last, which was very inferior; this remark is also applicable to a small and inferior description of pea, similar to the common Patna pea, which was sent under the erroneous designation of 'Marrowfat.'

"Your Committee have had before them a communication from Dr. J. R. Withecombe, a member of the Society (in reply to a letter from the Secretary), dated from Cape Town in May, 1856. Dr. Withecombe encloses copy of a correspondence with Messrs. Villet, and two letters to his address from Messrs. Upjohn and Templeman, also seedsmen of Cape Town, offering to supply the Society with seeds. Dr. Withecombe suggests that the Society share their patronage between these three seedsmen, instead of confining it to one, by which, he is of opinion, the Society may be better served. Dr. Withecombe has interested himself much in this matter, for which he deserves the best acknowledgments of the Society; but, before recommending that his suggestion be acted on, the Committee think it would be advisable to request Messrs. Upjohn and Templeman to send trial parcels to the Society, stating precisely what quantity of seed they could annually supply, *the produce of their own grounds*, and the cost thereof. The Committee will then be in a better position to offer a recommendation on the subject in their next annual report.

"Flower Seeds from England.—The Committee regret to announce that, with one exception, the reports received by the Secretary respecting the flower seeds supplied last year by Messrs. James Carter and Co., are unfavorable.

"The exception is a report from a member at the distant station of Umballa, who states that 60 out of 80 kinds had germinated most readily in his garden. It is not improbable, the Committee think, that the failure has been caused by the consignment having reached Calcutta a month before the usual time, whereby the seeds were exposed to the humid atmosphere of the rainy season. They would recommend that Messrs. Carter and Co., be directed to adhere strictly to previous instructions, namely, to send the next consignment not earlier than by the 20th August steamer, whereby it will reach this the first week in October. They should, at the same time, be informed, that if the next consignment prove unsatisfactory, the Society's patronage will be withdrawn. It should be added that Mr. McMurray's report of his first sowings of these seeds, made immediately after their arrival, is satisfactory, while his general sowings from the same packet failed; which tends to confirm the previously expressed opinion that they were afterwards affected by damp.

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"The Committee have to report that the seeds contained in the trial parcel from Messrs. Rollisson and Sons of Tooting, received in the middle of November, have germinated very fairly, which has been attributed by the Society's Gardener, not to the seeds having been originally of a better description than those sent by Messrs. Carter, but to their having arrived at a drier and consequently more favorable season. Messrs. Rollisson's charge, it should be added, is double that of Messrs. Carter and Co., for precisely a like assortment of seeds. Messrs. Carter and Co., can be directed to send with the flower seeds a supply of two desirable kinds of peas, namely the 'Early Emperor' and 'Daniel O'Rourke,' for cultivation in the Society's garden, with the view of raising a quantity of seed for general distribution in 1858; they might also send a small collection of bulbs of ornamental plants for the garden.

"*Ootacamund Vegetable Seeds.*—The reports on the trial collection of seeds from the Horticultural gardens at Ootacamund, in the Neilgherry Hills, having proved unsatisfactory, the Committee are not, at present, prepared to recommend another order from that locality.

"*Agricultural Seeds.*—The Committee have further to suggest that an order be sent to Messrs. Gibbs and Co., seedsmen to the Royal Agricultural Society of England, for an assortment of agricultural seeds (independent of the cotton, tobacco and maize seeds from North America.) The assortment should consist of flax seed, cereals of sorts, grasses of sorts, field carrot, turnips, cabbage, mangul-wurzel, &c., to the extent of say £100, as a beginning, to be paid for from the additional pecuniary grant recently accorded by the Hon'ble the Court of Directors of the E. I. Company. The consignment should reach this by the latter end of August. In order to admit of a fair average distribution, members of the Society, and others, should be requested to send in their applications before the month of August, specifying the kinds required, and the quantity of ground they are desirous of cultivating. With the view of enabling the Society to meet the wishes of the Court for an annual return of the result of the distribution of these seeds, each applicant should undertake to send in a full report in due course to the Secretary, giving full particulars of success or failure, and it would be desirable if specimens of such staples as flax, wheat, barley, oats, &c., raised from the seed, were sent in at the same time.

"The Committee have had before them a letter from Dr. Mouat, Inspector of Jails, Lower Provinces, applying for a good supply of American and Cape vegetable seeds for his jail gardens. The application has unfortunately reached too late as respects American seeds, but they recommend that a quantity of Cape seeds be placed at Dr. Mouat's disposal, at cost price, for the required purpose.

"Lastly, the Committee beg to recommend that members be allowed, as heretofore, an extra packet from each consignment of seeds, at cost price, provided they are required *bona fide*, for their own gardens: otherwise the

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charge to be the same as to a non-subscriber: further, that for all these extra parcels, cash be paid on delivery.

"In conclusion, your Committee beg to subjoin a memo. of the probable total cost of the consignments above mentioned, amounting in the aggregate to Rs. 7,800, exclusive of freight, insurance, and other contingent charges:—

Memorandum.

For vegetable, cotton, tobacco and maize seeds from North America,									
\$1,250,	..	..	..	..	..	..	..	Rs.	2,500
For vegetable seeds from the Cape of Good Hope,	..	..	..	..	..	..	..		2,000
For flower seeds from England,	..	..	..	..	..	..	..		2,300
									6,800
For agricultural seeds £100,	..	..	..	..	..	..	..		1,000
									Rs. 7,800
WM. G. ROSE.					S. DOUGLAS.				
C. A. CANTOR.					JOSEPH AGABEG."				

A recommendation was brought up from the Council for the adoption of the above report, with the following addition, viz:—"That a sufficient quantity of the two kinds of peas known as the 'Early Emperor' and 'Daniel O'Rourke' be obtained from Messrs. Carter and Co., for general distribution to members; and that a less quantity of beans than heretofore be procured from the Cape."

Proposed by the Rev. J. Long, seconded by Baboo Sibchunder Deb and resolved, that the recommendation of the Council be adopted.

Horticultural Exhibition.

Read the following reports of the Judges regarding the show of vegetables, fruits and flowers held in the Auckland Garden on the 23th January:—

"*Horticultural.*—The Judges beg to offer the following remarks regarding the first Horticultural exhibition of 1857.

"*First as regards Foreign Vegetables,* it may be observed, that cauliflowers were equally as well exhibited on this occasion as at any previous show, though the quantity was not so large; while Brussels sprouts was better represented at this time than on any former occasion. Scotch kale of two kinds were well shown and abundant. Of cabbages there were five sorts placed on the stands, the whole of which were well exhibited, both as regards quality and quantity, save the sugar-loaf, of which there were only a few heads, but of good quality. Endive of three sorts were abundant, well blanched, tender and young. Of spinach the broad-leaved and prickly seeded were well exhibited, being both young, green and tender. Of lettuce there were four kinds brought forward, viz., cabbage, black-seeded coss, brown Dutch and Paris coss, the whole in excellent condition and abundant. It is satisfactory to note that better specimens of celery are shewn year after

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year, and on this occasion, both the red and white kinds raised from seed during the rains, exhibited a marked improvement upon that of any former season. Celery raised from off-sets was also abundantly represented, but, as may always be expected, it was hollow, and only fit for flavoring soups, &c. The purple and white nolo-kole were abundant and good. Of turnips the yellow stone, white flat Dutch, globe and purple, were submitted in large quantities, and of excellent quality. Of carrots four kinds were placed on the stands, namely the long and short orange, early horn and long red, all in good order. Of beet-root, the blood red was perhaps better shown on this occasion than any other; besides these there was a large display of inferior sorts: also mangul-wurzel in abundance, and of good quality. Potatoes of four kinds were brought forward in different stages of maturity, the whole of excellent quality. The long-pod, Lima, French, and horse beans were placed on the stands in large quantities, and of good quality. Of peas the display was very fair and the quality excellent. Among the kinds recognised, were the Cape, marrowfat, Bishop's dwarf, early marrow, imperial blue, American imperial blue (this pea is generally taken for the Prussian blue, but it is a very different kind) sugar pea, and an ill-flavored variety with very large pods, which has been submitted on previous occasions. Of squash, the collection was not large, but the specimens placed on the table were good. Of asparagus the collection was small and poor, as might be expected so early in the season.

"In addition to the above there were baskets of onions, leeks, chives, turnip-rooted and long-radish, water-cress and pot herbs of sorts.

"*Of Indigenous Vegetables*, the collection was large and varied, including brinjalls of nine kinds, Tenasserim and other descriptions of yams, cucumbers, pumpkins, beans, sags of sorts, &c. A few baskets of ginger from West India stock, in excellent condition, were likewise placed on the stands.

"*Of Fruits*, the pomegranates were abundant and of good quality. Of sapotas there were many baskets, the size large, and the quality good. The mandarin orange, kumquat, and another red variety, which were submitted, were apparently grown in Bengal. Pine-apples and long and round plums were shown in abundance, and of excellent quality. Of pummelows there were three sorts placed on the table, of which the Madras white was the best. Guavas were large and well represented. Bullock's heart, loquat and rose-apple were indifferent, the quantity being small, and the quality bad. Plantains of three sorts were placed on the stands, the whole of good quality. Papia and bail were well represented. Of custard-apples, as might be expected, there was only a few baskets. A few mangoes from Ranocungo were produced, large, and nearly ripe. In addition to the above, several other kinds of fruits were brought forward, which would occupy too much space to detail. It may, however, be added that there were some fine specimens of sugar-cane raised from Mauritius and Singapore stock, fully equal to any previously exhibited.

"The show, on the whole, may be considered as very satisfactory." The competition was spirited; about 200 mallees having been in attendance, to 59 of whom prizes were awarded to the extent of Rs. 355, also 4 bronze medals for the best specimens of celery, potato, turnip, and Windsor bean. The amount was distributed by Dr. Thomson, Vice-President.

S. DOUGLAS.

WM. G. ROSE.

PEARY CHAND MITTRA.

JOSEPH AGABEG.

"*Floricultural*.—The Judges have to remark that the collection of plants was limited, as is usually the case at this first show of the season; the competition too was less than at the January Exhibition of 1856; the produce of only 20 gardens being submitted, to 13 of which prizes were awarded to the extent of Rs. 79, as per annexed list.

"Among the few plants calling for notice, were *Pelargoniums* from the garden of Mr. H. Wood; though not 'in flower,' the Judges considered them deserving of a prize, as the collection comprised 18 exceedingly healthy, well grown specimens. The Auckland Garden contributed a good collection of roses of 7 kinds, which received the first prize in that department. Mr. J. A. Cockburn submitted a fine collection of begonias; from the garden of Mr. Currie, came an excellent assortment of violets, perhaps the best yet exhibited; and good specimens of *Astrapea Wallichii* and *Epiphyllum* — ? from the gardens of Mr. H. H. Poe and Baboo Kissory Chand Mittra. The Barrackpore Park Garden contributed several well-grown plants, including a *Thibaudia segitera*, a novelty at our shows. The Hon'ble Company's Botanic Garden and the Society's Garden both contributed plants for exhibition only; in the collection from the latter garden were some exceedingly well-grown samples of *Euphorbia jacquiniflora*, *Abutilon Bedfordianum* and *Habrothamnus fasciculatus*.

"There was an equally great, if not greater number of visitors than at the show held on the 25th of January last year.

"The Judges conceive that the best acknowledgments of the Society are due to Major Clarke and the other officers of H. M. 53rd Regiment, for the services of their fine band; also to Captain Mark Currie, Commissary of Ordnance, Captain J. C. Hodgson, Garrison Engineer, and Messrs. Burn and Co., for the loan of tents, stands, &c., for the show.

THOMAS THOMSON.

BENJ. WARWICK.

E. W. WINGROVE."

Nursery Garden.

The Gardenor's monthly report was submitted. Mr. McMurray forwards a tabular statement wherein the result of the trial sowings of the Melbourne

vegetable seeds, presented last month, by Mr. Scott, is shown : from this it appears that, with exception of 5 kinds, the per centage is favourable, namely 63 per cent. Mr. McMurray goes on to report as follows :—" In continuation of the few remarks made in my last report on Carter's Daniel O'Rourke pea, I have now to state, that a second sowing has been made, which germinated freely, and from the present appearance of the crop I hope to be able to submit some of the produce at the next meeting of the Society. It may also be interesting to record that the Chinese rice paper plant (*Aralia papyrifera*) has yielded a good crop of seed this season in the garden, which is probably the first time the plant has been noticed to produce seed since its introduction by Mr. Fortune in 1854, and which proves the climate of Bengal to be well adapted to the cultivation of the plant. The seed now forwarded may be distributed to Members desirous to send some of it to their friends at a distance from Calcutta, as the plant will soon become a common weed in this neighbourhood, from the readiness with which it increases itself by throwing up suckers from the roots."

The Gardener next notices several contributions to the garden during the past month, and closes his report with the following calendar of operations for the present and beginning of the ensuing month :—

"*In the Conservatory and Flower Garden.*—If previous directions should have been attended to, the young stock for next season's bedding out stuff will be pretty well advanced, and fit for potting off singly into pots ; where such is the case, there should be no time lost in getting the plants established in their new situation before the hot weather sets in. The majority of soft-wooded plants thrive best in a light rich compost, but where verbenas are cultivated, a good portion of gravel should be mixed with the soil as those plants are liable to damp off very much during the rainy season. Where the stock of all or any of these plants are short, cuttings should be put down without delay, as during the hot and rainy seasons there is great difficulty in making successful striking. Chrysanthemums and Artemesias and other like plants, which have done flowering this season, should have their roots divided and potted off singly into small pots at first, and as they advance in growth, the plants should be shifted into larger sized pots, so as to ensure a healthy young growth before the setting in of the rains, which will well repay the trouble by an abundance of flowers during the cold season.

"Bulbous rooted Gloxinias will at this time require repotting into a light rich soil, and at first but sparingly watered until they have made a few healthy young leaves, after which they will require a plentiful supply of water to bring the flowers to perfection. Some of the early sown annuals will by this time be beginning to ripen seed, which should be attended to, and collected daily in the morning, as many of the kinds scatter the seed when the sun is strong by ten o'clock in the day. Attend to former directions and keep the ground clear of leaves, &c., &c.

"In the Orchard.—Where young grafts of peach trees, mangoes, pum-melows, &c., &c., have been set out during the last season, attention should be paid to pinching off the suckers, which spring up from the stocks at this season, which, if neglected, will kill the scion. Plant out peach trees and other fruit-grafts, as at this time, where the ground is well prepared, the trees will be well established before the setting in of the rains, when a healthy growth will be the result during that season, and as soon as the sap be fairly in circulation, grafting or inarching should be commenced; peach trees that have had the present season's crop of fruit well set, should be well supplied with water at once, and continued at least once a week while the fruit is swelling.

"In the Kitchen Garden.—The remarks on last month apply generally to this, but there is less chance of success in rearing vegetables as they will seldom acquire much strength before the hot weather sets in; but still radishes, mustard, and cress, lettuce, spinach, and indeed the whole of the cabbage tribe should be tried in this month, and indeed throughout the year. Sow melons and all the *Cucurbitaceous* tribe; be careful about dashing water into the hearts of celery, otherwise they are sure to rot, and cabbages that have been firmly bound should not have the same quantity of water as those that are not in a closed state."

The Council reported that they had elected the following members to their Sub-Committees; viz. *Finance.*—Messrs. Cantor, Douglas, and Peary Chand Mittra. *Papers.*—Mr. Grote, Dr. Thomson, and the Rev. J. Long. *Correspondence.*—Messrs. Rose, Grote and Douglas.

Communications on various subjects.

The following letters were also read :—

1. From Captain D. Briggs, Superintendent Hill Roads, dated Umballa, 19th January, suggesting the introduction of the sweet chesnut and olive into the valleys of Kunawur :—

"You are doubtless aware that the valleys of Kunawur produce some of the most magnificent *horse*-chesnuts in the world. I am of opinion that at a lower elevation the Spanish (or sweet) chesnut would succeed admirably. The inhabitants of Kunawur are in the habit of steeping the horse-chesnut in water, to extract its acrid flavour, and grinding the nut into flour, which they mix with barley or wheat flour, to increase the limited quantity of the latter they possess. The substitution of the sweet chesnut for this unwholesome and unpalatable nut, would be a real boon to the poorly fed hill-men, and if the Society see fit to provide me with seed, I will do my best to introduce the tree.

"I also beg to suggest the introduction of the olive in the valley of Kunawur, as a matter of no little importance. A climate that is so favorable to the growth of the vine, is surely not unsuited to that which, in almost every other country, is its companion."

The following recommendation of the Council in respect to Captain Brigg's suggestion, was unanimously adopted :—

"That an application be made to the P. and O. Company to request their agents at Gibraltar to endeavour to procure a quantity of olive and chesnut seed ; that Mr. Cantor's kind offer to apply to his correspondents at Marseilles be thankfully accepted ; and that an application be made to the Superintendent of the H. C. Botanic Garden, Dapoorce, for acclimated seed. Further, that Captain Briggs be recommended to apply to Dr. Jameson for seeds and seedlings of the China chesnut raised at the Saharunpore Garden from seed forwarded by Mr. Fortune."

2. From F. Bashford, Esq., forwarding some cocoons, the result of his cross-breeding with Europe and Indian silk-worms. "These are not my best, by far," observes Mr. Bashford, "I have had worms spinning every day for upwards of three months, and have now (22nd January) a very large quantity of young worms, but the weather is so cold and mulberry so scarce, I am very doubtful about success ; they feed now double as long as in milder weather, and get so numbed with the cold as to have scarcely strength to form a cocoon. My cross and even fine French, Italian and China eggs of last year are hatching now daily in large numbers, notwithstanding the cold : I am sadly puzzled how to keep them, so many different stages going on in the same house. Our Bengal cocoons this year have been very fine, the crop has been small, but finer cocoons from indigenous worms I never saw."

3. From the Secretary, Society of Arts, London, dated 15th December, acknowledging receipt of the bales of straw of different kinds which were sent last year for experimental purposes as materials for paper-making. "I will use every endeavour," writes Mr. Foster, "to obtain an opinion with regard to the bales of straw, but there has been some difficulty about this, as the machinery used by the paper-makers here is usually unfit for treating such a material. However, I am now in communication with a firm, who will, I have reason to believe, be able to do all that is necessary."

4. From Dr. F. J. Mouat, acknowledging receipt of the Society's communication on the subject of Atces, and stating he has sent for a quantity of the powder, with the view of having a full and fair trial given to it in the Jails under his superintendence.

5. From H. Cope, Esq., submitting a specimen of Himalayan Box to compete for the prize for the best substitute for Turkish Box.

6. From Captain F. W. Ripley, Sandoway, advising despatch, in compliance with the Society's application, of a quantity of fresh cocoons of the mulberry silk-worm of Bassein. Captain Ripley states that all previous attempts to send the eggs having failed, he hopes this despatch of cocoons may prove more successful.

The Secretary announced that the moths of this fine description of worm had, unfortunately, escaped from the cocoons during the passage.

7. From H. M. Low, Esq., dated 5th January, a few items on horticultural subjects from Thayet Myhew. "Of the Ootacamund seeds you sent me the beet and tomato have succeeded very well, but I cannot report favorably of the others. The China yam has produced well, considering the sets were small. The quality of this yam is very good, white as snow and mealy. I have some white yam from Ammeerapoor, much larger, but then the original tubers were of a corresponding size. The yam principally grown in Pegu is purple and watery. We have peas now : Windsor beans very fine, celery well blanched, 8 inches long and $1\frac{1}{4}$ inch thick ; carrots large and good quality, sown about the 24th May, others in succession. Cabbages and cauliflowers very tardy, and until we succeed with our own *desea* seed, I do not expect cauliflower before the middle of January. Turnips of different sorts fine, and what I have not before seen, beautiful Swedish Turnips, though not yet ripe of course : it is always slow in its growth at home. I have English vines in the ground and peach trees ; but I do not expect much from them. Oranges and litchies are thriving, and will do better."

(*The 18th March, 1857.*)

Baboo Peary Chand Mittra, Vice-President, in the chair.

Major R. Strachey, Messrs. R. Berkeley and W. Willocks, proposed at the last meeting, were elected Members.

The following gentlemen were proposed as Members :—

W. M. Smith, Esq., Jutropore, Kishnaghur ;—proposed by Mr. Edward Lushington, seconded by Mr. J. W. Smith.

Lieutenant G. H. Hale, Adjutant 2nd Regiment Infantry, Oude Irregular Force ;—proposed by Mr. W. G. Rose, seconded by the Secretary.

The Rev. C. E. Hadow, B. A., Chinsurah ;—proposed by Mr. G. B. Robinson, seconded by Mr. James Church.

Baboo Sham Churn Mullick ;—proposed by Baboo Peary Chand Mittra, seconded by Rajah Pertaup Chunder Sing Bahadoor.

Mr. W. Berrill, Allahabad ;—proposed by Mr. E. F. Flouest, seconded by the Secretary.

The following contributions were announced :—

1. Selections from the Records of the Government of India, Nos. 20 and 21. *Presented by the Government of Bengal.*

2. General Report on the administration of the several Presidencies and Provinces of British India during the year 1855-56, Parts 1 and 2. *Presented by the Government of Bengal.*

3. The Philosophical Magazine, 43 Volumes. *Presented by James Morris, Esq.*

4. Journal of the Royal Asiatic Society, Volume 16, Part 2. *Presented by the Society.*

5. A small supply of New Granada Paddy. *Presented by W. Jordan, Esq., of Lima.*

It was resolved, on the recommendation of the Council, that this seed be distributed to members willing to give it a trial, and communicate the result ; further, that a portion be placed at the disposal of the Commissioner of Pegu, for trial in that Province.

6. Samples of Himalayan cotton and castor-oil seed ; also a few seeds of *Coniferae*. *Presented by Lieutenant J. F. Pogson.*

The following is extract of a note from Lieutenant Pogson, on the above subject :—

“ I send some seeds of the Paper plant [*Chaptalia gossypina*] of which I think Captain Briggs sent you the bark as stated in the last proceedings of the Society. The parcel also contains some choice Himalayan seeds, amongst others, the red or real Pencil Cedar, which I obtained from Thibet. I hope it will grow at Darjeeling, Cherra Poonjee, and Ootacamund, also in the Society's garden.”

7. Samples of Potatoes raised at Shahapore Oondee, Tirhoot, from acclimated Darjeeling stock. *Presented by Mr. J. Willis on behalf of Mr. Justin Finch.*

A few copies of Volume 9, part 3, of the Society's Journal, just received from the press, were placed on the table.

The following recommendation of the Council was unanimously adopted :—
 “ That Mr. Nash, having been unable to procure the Sea Island cotton seed, for which the sum of Rupees 250 was voted in January 1855, the same amount be applied for obtaining a quantity of Pernambuco cotton seed, and That Mr. Stewart Douglas be requested to assist the Society in obtaining it.”

Garden School.

A long report by a Sub-Committee of the Council, (consisting of the Rev. Mr. Long, Dr. Thomson, Baboo Peary Chand Mittra, and the Secretary,) on the present unsatisfactory state of the Garden School, with suggestions for the training up of a body of practical gardeners, was submitted by the Council, with a recommendation for the adoption of the proposals contained therein.

The Committee give a sketch of the origin of the School in 1847, and its operations to the present time. They detail the various measures which have been adopted to introduce lads into the school ; they also allude to the unsuccessful appeal which was made two years ago to Mofussil members, and to subsequent ineffectual attempts to obtain boys from the interior, and close this portion of their report with the following note on the result :—

“ It is worthy of notice that after an existence of 9 years, during 6 of which about 60 boys have entered the school, and the expenditure of about

Rupees 3,500 for wages to scholars and masters, only two lads—so far as can be traced—have followed the profession of gardening, both of whom are at present employed in Calcutta. Dr. Thomson has stated to your Committee that this result, poor though it be, is more favorable than that of the school attached to the Botanic Garden, which, he believes, has not turned out a single *mali*.

“The failure thus recorded has not arisen from want of encouragement. Due notice was given to the lads on entering the school—and frequently reiterated,—that when sufficiently acquainted with their work, they would receive good situations in the Garden, and, that as applications were made to the Society, they would obtain situations with wages ranging from 8 to 16 Rupees a month, according to their ability. The failure may rather be attributed, the Committee think, to the desire which a little knowledge of reading and writing has imparted to them of following occupations which are not only considered more respectable, but which probably give a more *immediate* profitable return in the shape of wages:—thus, a lad would rather take employment as a sircar at 7 and 8 Rs. a month, than as a *mali* at 6, though he might in the course of a few years, obtain *double that sum*: in fact, the one is more *tangible* than the other, consequently more prized.”

The Committee conclude their report with the following suggestions:—

“To combat such a state of things is a difficult task. Nevertheless, your Committee think efforts should be continued; and that as it is impossible any permanent improvement can take place in horticulture without an intelligent and trained body of *malis* to carry them out, and as much money is wasted in the distribution of seeds, and the establishment of gardens, owing to the ignorance of the existing class of *malis*, they would propose:—

“*First.* That the Society apply to the magistrates of certain districts of Bengal, say 24-Pergunnahs, Hooghly, Kishuaghur, Berhampore, Bhaugulpore, Patna, Jessore, Tirhoot, Dacca, Rungpore, Dinagepore, and Rajshahaye, to send down a *mali* from each district, or 12 in all as a beginning—men not beyond 30 years of age, to learn practical gardening in the Society’s Garden, the Society giving them mere elementary education in Bengali for a period of one or two years, and agreeing to allow each man Rs. 6 per mensem, exclusive of travelling expenses, from the period of engagement, till the completion of the proposed period. After which time a certificate of proficiency if entitled to it, to be granted to them, to enable them to obtain situations elsewhere of Rs. 10 a month; and further, guaranteeing them that amount till they obtain such situations: it being distinctly understood that, a *mali* declining to accept a situation, will not be entitled to receive any further stipend from the Society, and, in the event of a *mali* not obtaining a certificate of proficiency within two years, the Society’s engagement with him will cease.

“*Second.* That the present system having proved a failure, the services of the Schoolmaster be dispensed with temporarily.

"*Third.*" That the 5 Christian boys be continued on the establishment, and as many more be received, if obtainable, until the replies are received from the Magistrates, when the subject can again be brought forward for consideration."

The subject matter of the report having been discussed at some length, it was duly proposed and resolved, that the recommendation of the Council for its adoption be confirmed.

It was subsequently proposed by Mr. Stalkartt, seconded by Mr. Charles Gubbins, and resolved,—“that the gardeners sent down shall be able to read and write their own language, and be generally intelligent.”

In connection with this subject, the Secretary read a letter from Baboo Puddun Lochun Mundul, zemindar of Balasore, sending two young men at his own expence to be trained up as gardeners in the Society's garden; whereupon the following resolution was duly passed:—“That the cordial thanks of the Society be given to Baboo Puddun Lochun Mundul of Balasore, for his liberality, and the Society hope that this good example may be followed by other zemindars and planters.”

Vegetable Fibres.

A report was submitted by a section of the Flax and Hemp Committee (Messrs. William Thomson and William Haworth), on sundry samples of vegetable fibre received during last year by the Society from Arracan, Berhampore, Goruckpore, and the vicinity of Calcutta.

Another report was submitted by a section of the Committee (Messrs. Stalkartt and Thomson) on sundry samples of flax from Punjab and N. Berar.

Ordered that copies of these reports be sent to the respective contributors for their information, and that the originals be transferred to the Committee of papers for publication in the Journal.

The Secretary brought to the notice of the meeting a bundle of flax straw and of fibre therefrom, cultivated and prepared in the vicinity of Chandernagore by Mr. George DePenning. The straw is fully four feet in length, branchless, and of a fair thickness; the fibre prepared from it is considered by the Committee a very creditable specimen; it would probably realize as much as from £45 to £50 per ton in England. Mr. DePenning mentions that it is the produce of the Dutch seed he obtained from the Society last year, it was sown about the 15th November, a maund to the biggah, and pulled about the 15th February. The process usually adopted of water-retting was followed, and two days' steeping, Mr. DePenning found to be quite sufficient.

The Secretary further drew the attention of the members to certain samples of flax straw submitted by Mr. Joseph Willis, and read a communication from that gentleman respecting them:—

“I obtained from you a few seers of Dutch linseed early in December 1856, and at the same time I procured a few seers of large Patna linseed from

the bazar for a small experimental cultivation in my garden ground at this place [Garden Reach.]

"The land was not well tilled and but barely manured, and it is rather tenacious in its nature.

"The sowings were made from the 10th to the 16th December, 1856, when the land had become somewhat too dry after the last fall of rain on the 30th, and 31st October, 1856.

"I will now observe a little on the two specimens of linseed or *Tessee* plants, which I lay before you to be shown at your Agricultural and Horticultural Society's Meeting of this day. The plants were taken from the garden yesterday. First are four (4) plants from the Dutch linseed. Length from $2\frac{1}{2}$ to 3 feet each plant.

"Seed ripe and unripe and in flower at same time, seed very small, and inferior, and scarcely yielded from two to five stems in each plant.

"The root a short tap and branching.

"Plants healthful and at dimensions apparently sufficient to afford encouragement to cultivation for the sake of the fibre only.

"Second are three (3) plants from the Patna linseed. Length from 1 foot 6 in. to 2 feet each plant.

"Seed all ripe and ripened at once.

"Seed of middling size, but not equal in size to the parent seed.

"Seed tolerably abundant on the plants.

The plants have from 5 to 10 or 12 stems each. The roots are longish tap, and but little broken or divided.

"Plants healthful, and of dimensions less encouraging of the growth for the sake of fibre, than those from Dutch seed, but much encouraging as respects produce in seed.

"Without pretending to claim any merit in this matter, as the specimens with my few observations in connection, may be of some interest to some of the members of your meeting to-day, I have thought it well to lay them before you."

Raw Silks.

A report was submitted from a section of the Silk Committee (Messrs. Rose and Willis) on sundry samples of cultivated raw silk from the Punjab, and of wild silk from Moulmein, which were forwarded to the Society at the end of 1856, by Mr. Cope, Major Burnett, and Captain Haughton.

Ordered that copies be sent to the contributors for their information, and that the report be transferred to the Committee of Papers.

Horti-Floricultural Exhibitions.

Submitted the following reports of the Judges on the show of vegetables, fruits and flowers held in the Auckland Garden on the 5th March :—

"*Horticultural.*—The Judges have the pleasure to report that the second show of the season held in the Auckland Garden on the 5th March was equally

as well supplied with samples of vegetables and fruits, as that held on the 1st March, 1856.

"*As regards Foreign Vegetables*, it may be stated that the Brussels' sprouts were as well exhibited on this occasion as at the last show, which surpassed any previous exhibition. Cauliflowers were submitted in small quantities, but of fair quality. White broccoli of two kinds were abundant and good. Scotch kale of two kinds were well represented. Of cabbages, sugar loaf, Savoy, early York, Battersea, red and drum-head, were placed on the tables in large quantities, and of excellent quality. The broad leaved and curled endive were well blanched and abundant. Of spinach the broad leaved and prickly seeded were shown in a green and tender state. The cabbage lettuce, brown Dutch and black seeded coss, were abundant and well blanched. Of celery the red and white kinds were in excellent condition, being both solid, well blanched and large; these were raised from seed. Celery from off-sets were more abundant than the former, but, as may always be expected, it was hollow and altogether inferior. The purple and white nole-kole were placed on the stands in different stages of maturity, and in large quantities, some in excellent condition, and others over-grown. Of turnips the white flat stone, yellow stone, globe, and the Aberdeen red, were all abundantly represented, and in good order. Onions in different stages of maturity were also well represented. Chives were not abundant, but the samples brought forward young and green. Leeks were exhibited in abundance, and of excellent quality. Carrots of five kinds were placed on the stands, viz., long red, short horn, orange, white and black,—all good. There were several good specimens of turnip-rooted and long red beet. Mangul-wurzel was also abundant, and of large size. Potatoes of five kinds were placed on the stands in different stages of maturity, abundant and of fair quality; but unfortunately, the disease was observable among some of the samples: the New Zealand purple potato imported this season was exhibited in the above number, free of this malady. Several good baskets of beans, viz., the Windsor, long pod, Lima and French were exhibited. Of peas, the collection was very good, and the quality excellent; of squash, the collection was but small, but the quality good. Several bundles of asparagus were placed on the tables in pretty fair condition. The same remark is applicable to artichokes. The usual kinds of herbs were introduced, all in good order. Horse-radish was abundant, and of good quality. Fennel and sea kale were exhibited on this occasion in pretty fair condition, and also the triple-curved parsley.

"*Of Native Vegetables*, there were many baskets of the usual kinds, such as saugs, beans, brinjalls, kurrillas, cucumbers, pumpkins, yams, chillies, capscums and ginger; the whole in a green and tender-looking state. And of *Fruits*, guavas, limes, lemons, and oranges were well exhibited, as also pomegranates, pine-apples, sapotas, and loquots—though early in the season for the latter. Bails of three kinds were abundant, and of good quality; likewise pummelows of three kinds. Peaches and mangoes were shown in a green state,

but were not considered worthy of a prize; a few good strawberries were likewise brought to notice. Papias were plentifully exhibited and good—and plantains were very abundant and good.

“A few good bundles of sugar-cane and some fine cobs of maize, apparently from American stock, were likewise submitted.

“About 150 gardeners were in attendance on this occasion, and prizes amounting to Rs. 300, and 4 bronze medals, were award to 55, according to the annexed list. The Rajah Pertaup Chunder Sing, Vice-President, distributed the prizes.

WM. G. ROSE,

ST. DOUGLAS,

PEARY CHAND MITTRA.”

“*Floricultural*.—This show was not equal to that held on the 1st March, 1856, either as respects the quantity or quality of the specimens submitted. The produce of about 30 gardens were brought forward and prizes, amounting to Rs. 103, awarded to fifteen, as per annexed detailed list.

“Among the few novelties were plants of *Franciscea eximia* from the garden of Mr. Grote, of *Abronia umbellata* from Mr. Bartlett's garden, a species of *Vencedium* from Mr. Warwick's garden, and a new kind of *Oncidium*, and a *Rutaceous* plant from the garden of Rajah Nursing Chunder Roy. There were large collections of phloxes, portulacas, pinks, heartsease neither large nor good, and verbenas, and a few good specimens of campanulas, and double larkspurs. The bulbous tribe were very indifferently represented, but the collection of orchids was tolerably fair. Of oxalis, only a few plants were submitted, and not a single specimen of German asters, of which there was such a good collection at the March show of last year.

“The collection of annuals was very limited, as was to be expected, in consequence of the failure of the seeds, and the unusually dry season we have experienced, unrelieved by a single shower of rain for four months.

“Some well grown plants were introduced from the H. C. Botanic Garden, and the Society's garden, for exhibition only, not for competition.

“The attendance of visitors was great, though not so numerous as at the last show.

“The judges have again to bring to the notice of the Society the kindness of Major Clarke and the other officers of H. M. 53rd Regiment for the services of their Band; and the assistance so obligingly rendered by Captain Currie, Commissary of Ordnance, Captain J. C. Hodgson, Garrison Engineer, and Messrs. Burn and Co.

THOMAS THOMSON,

BENJ. WARWICK,

S. P. GRIFFITHS.”

Nursery Garden.

The Gardener's monthly report was submitted. Mr. McMurray remarks "that Carter's Daniel O'Rourke pea has matured the second crop this season from the same seed. The produce of the small quantity sown for that purpose is now forwarded for laying before the present meeting. As two very different kinds of peas have been sent to the Society under the same name (Daniel O'Rourke), it may be as well to state that Messrs. Carter's Daniel O'Rourke pea plant only grows eighteen inches in height, while Messrs. P. Lawson's Daniel O'Rourke pea plant, received at the same time, grows from four to four and a half feet in height, and is only a secondary kind in comparison with that of Messrs. Carter's; although it is an excellent bearer, well flavored, and is quite a new and distinct variety to any I have previously met with in India.

"I may here state that neither of the crops received any artificial watering during their whole growth. As the Society proposes to order out from England two kinds of peas for general distribution to the members, I would suggest that it would be desirable to procure two or three quarts of seed of each of the leading kinds of peas now cultivated in England, as an experiment for growing in the garden, from which it would enable the Society hereafter to know what kinds of peas were best adapted for cultivation in Bengal; for instance, Knight's tall marrow-fat pea is not at all adapted for that purpose, as may be seen from the returns of the produce of the peas grown in the garden during the last seven years.

"The Chinese Green Dye plants are flowering very freely at present in the garden, from which a good quantity of seed will probably be obtained for distribution to the members next season; in addition to this there have been between three and four thousand layers and cuttings of the same plants put down for the same purpose.

"The prospect of a crop of fruit this season in the garden is generally very fair; of mangoes and lichees there are very few indeed, but of peaches there will be a fair crop from present appearance. The several kinds of pine-apple plants are also showing well to yield a good return; of pummelows, limes, and lemons the produce will also be abundant from the present appearance of the set of fruit, the Avocado pear trees are at present laden with flowers from which a good return of fruit may be expected.

"The *Vanilla planifolia* is flowering freely, and the fruit is being set daily. The belt of cocoa-nut trees along the North boundary of the garden is bearing a heavy crop of fruit, and the American apple trees are showing flowers."

Resolved.—That the Gardener's suggestion in regard to the peas be adopted.

A detailed report from Mr. Scott, Head Gardener, H. C. Botanic Garden, on trial sowings of Messrs. Carters' and Rollisons' flower seeds, was likewise submitted.

Communications on various subjects.

1. From A. Forbes, Esq., Dacca, suggesting the propriety of experiments being made as to the proper quantity of indigo seed to be sown in a beegah of ground. The following is extract of Mr. Forbes' letter:—

"There is a subject which is one of the very greatest importance to the country, and which has never been taken up by the Agricultural Society, and it is one on which the most varying theories prevail among Indigo Planters, and that is, what is the proper quantity of Indigo seed to be used? Some say that the plant ought to be very thick in order to make it grow up quickly, others vote for thinly sown plant. From what I know of planters they are a race very unwilling to enter upon a set of experiments, and rightly so too, for they are generally managers for others to whom they would be accountable should their experiments be the cause of failure, but I think the Society, which now numbers a good many Planters on its subscription list, should make itself a set of experiments with different quantities of seed in various soils, and should issue a circular to its planting members begging them to do the same. The subject is one involving the expenditure yearly of many thousands of Rupees. The experiments should be made with different quantities of seed sown on the same day on both *mattial* soils and sandy soils. The number of ploughings should be given with the size of the plots in square feet not in *nulls* or *haths*. The weather soon after sowing, and during cutting, should be noted. The height of the plant, whether it was leafy or stalky, whether the leaves were *cutcha* or *pucka* at the time of cutting, the quantity of bundles fairly measured with the six feet chain, the cubic contents of the vat, and the produce in seers per vat ought to be given. I trust that the Society will consider the subject of sufficient importance to be taken up in as earnest a spirit as has been given for some years past to the cultivation of fibrous plants."

Resolved,—on the recommendation of the Council, that a circular be issued, embodying the particulars contained in Mr. Forbes' communication, to all the members of the Society engaged in indigo cultivation, and that they be requested to communicate the same to their friends, who are not members, and furnish the Society with the result.

2. From W. Taylor, Esq., Commissioner of Revenue, Patna, returning thanks for the donation of a set of the publications of the Society for the recently established "Behar Industrial Institution," and forwarding a copy of a little pamphlet detailing the particulars of the scheme.

Resolved,—on the recommendation of the Council, that such portions of this pamphlet as relate to Agricultural subjects be embodied in the proceedings of this Meeting; further, that supplies of seed, more especially of the Agricultural seeds expected in September next, be placed at Mr. Taylor's disposal.

The following are the extracts from the pamphlet:—"Agriculture.—The object of this department of the Institution will be, to disseminate scientific truths, to introduce new products, to test by experiment such of the more

obvious of the plans and improvements as have been found eminently successful in Europe, and as may appear in the eyes of cautious and experienced people to be applicable to Indian farming. To direct the attention of the zemindars, farmers, and agriculturists to these products, plans and improvements, and to induce them to adopt such as may be found to answer or to offer fair promise and likelihood of success.

"If nothing else were to be gained, it would be no little matter to have excited the interest of the landholders and people and to have roused a spirit of enquiry.

"The native mind is well able to appreciate the results of scientific experiments when made palpable to the senses, and the farmers of Behar will not be slow to adopt what is proved to be profitable.

"I have no idea of attempting to force upon the people an artificial system of high farming with its elaborate appliances and doubtful results, but I feel very sanguine that the gradual and judicious introduction of better ploughs, threshing machines, and similar aids to industry will be eminently useful.

"*Cattle*.—The improvement of the breed of cattle is a matter of practical utility and speedy results.

"A few English bulls have, at various times, been introduced into these districts by individual gentlemen, and the greediness with which their society has been sought for, and the acuteness with which clandestine interviews have been contrived by the cow-keepers, has proved how fully they understand the value of superior stock.

"The half-breeds which have sprung from this illicit intercourse are now eagerly sought for, and purchased at high prices.

"This will form a regular branch of the Institution, and I anticipate the hearty co-operation of the great Landlords, Indigo Planters, and others in the work.

"Whether any satisfactory results are likely to be attained by endeavours to improve the breed of sheep, I cannot venture to predict, but the subject will form matter for careful enquiry and experiment.

"Questions have been circulated through the Collectors of the Districts to all those who are supposed competent to supply information on this subject; and much valuable information has already been collected."

3. From the Secretary Medical Board, acknowledging receipt of the reports furnished by the Society regarding the drug "*Atees*," and returning the thanks of the Board for them. "Many months since," adds Dr. Chevers, "portions of "*Atees*" were sent by the Board for trial at the Presidency General Hospital and Medical College Hospital. Since the receipt of your letter, the Medical Officer's reports upon this trial have been again called for. Upon their receipt the Board will have much pleasure in furnishing the Society with any additional facts of importance regarding the medicinal action of the drug which they may convey."

4. From C. B. Stewart, Esq., Superintendent P. and O. Company, intimating that the wishes of the Society for a supply of seed of the sweet chesnut and olive, through the medium of the Company's agent at Gibraltar, will be attended to.

5. From Dr. Gibson, Superintendent Botanic Gardens, Bombay Presidency, intimating his inability to send acclimated olive seed, as though many of the trees in the Botanic Gardens under his charge are as large as any of the sort to be found in Eastern Italy, they have never seeded. Dr. Gibson, however, offers to send as many young rooted plants as may be required, but suggests that their despatch be deferred till a more favourable season.

Resolved,—that the thanks of the Society be tendered to Dr. Gibson, for his obliging offer, and he be requested to send the plants at the time he may consider the most favourable for their transmission.

6. From Lieutenant J. F. Pogson, Simla, dated 4th March,—“As you are writing home for seeds would it not be advisable to try the French and Spanish cork trees up here, as also the olive and sweet chesnut? The ordinary horse-chesnut grows luxuriantly up here, why should not the sweet-chesnut thrive as well: it would be of immense importance if this tree could be introduced into the Himalayas.”

The Secretary announced that this suggestion had been anticipated by the resolution passed at the last meeting.

7. From Lionel Berkley, Esq., Delhi, dated 4th March, alluding to the English flower seeds received last season from the Society:—“I was surprised to see from your report that the English flower seeds distributed last year were a failure. Those supplied to me, though sown with much less care than they generally receive from me, germinated remarkably well. I think only 15 or 16 kinds failed. I do not think the failure in the seeds, should chiefly be attributed to their being received early and exposed to damp, but in a great measure to the way they are sown by the native gardeners and swamped with water. I have always been most successful in raising English flower seeds in pots about the 15th or 20th of September. The pots are kept in a sheltered situation during the heat of the day, moderately watered, and put out in the evening.

“This care is only necessary for a fortnight or so, after which they should be kept out entirely. The seeds sown early require a little more care at first than those sown late, but the former always come to greater perfection, and produce healthy flowers for a longer period. I only put in some portulacas, balsams, zinnias, minor convolvulus, and ipomeas the other day, which I had reserved for trial at this season in a summer-house, and they have all germinated, so that the damp could not have affected all the seeds.”

Proceedings of the Society.

(15th April, 1857.)

Baboo Peary Chand Mittra, Vice-President, in the chair.

Lieut. G. H. Hale, the Rev. C. E. Hadow, Messrs. W. M. Smith and W. Berrill and Baboo Sham Churn Mullick were elected Members.

The following gentlemen were proposed as Members :—

H. T. Raikes, Esq., Civil Service, Calcutta ;—proposed by Mr. E. T. Trevor, seconded by Mr. W. Dampier.

Capt. W. H. Oakes, Deputy-Commissioner Chota Nagpore ; and Captain J. S. Davies, Senior Assistant-Commissioner ;—proposed by Captain E. T. Dalton, seconded by the Secretary.

George May, Esq., Merchant, Calcutta ;—proposed by Baboo Peary Chand Mittra, seconded by Baboo Rangopal Ghose.

Lieutenant Swanton, Assistant-Commissioner, Roy Barcilly ; and P. Carnegie, Esq., Assistant-Commissioner, Pertabghur, Oude ;—proposed by Mr. M. H. Court, seconded by the Secretary.

Baboo Puddum Lochun Mundul, Zemindar of Balasore,—proposed by Baboo Peary Chand Mittra, seconded by Baboo Shib Chunder Deb.

The following contributions were announced :—

1. Irrigation in the Madras provinces, by Colonel Baird Smith. *Presented by the Government of Bengal.*

2. The Tenasserim and Martaban Almanac and Directory for 1857. *Presented by Sir A. Bogle.*

3. A Collection of Orchids from Upper Assam. *Presented by Captain W. H. Lowther.*

4. A quantity of Kemaon tea seed. *Presented by Dr. Jameson.*

5. A few seeds of Ceylon coffee seed. *Presented by Messrs. G. Hall and Co., of Colombo.*

6. A few seeds of mandarin orange from Malta. *Presented by Lieutenant-Colonel H. Spottiswoode.*

7. A specimen of the preparation of the juice of "*Euphorbia pentagonia*." *Presented by Captain David Briggs, Superintendent Hill Roads, Simlah.*

"You will perceive"—writes Captain Briggs—"that this preparation has many of the qualities of 'gutta percha.' Place the lump in boiling water, and it will become as soft as 'gutta' would, and very elastic ; but you must first manipulate it well, in order to bring the whole mass to an equal consistency. When boiled in a vacuum at a high temperature, it becomes one of the best and strongest adhesive substances I have ever known, and wholly unaffected by temperature. Had I more time at my disposal I feel confident that I would find out some means of making the substance of very general use. Even now, if properly treated, I believe it would answer the purpose of 'gutta' in Electric Telegraph operations."

Resolved,—that this specimen be forwarded to Mr. Brunt, at Bombay, and that he be requested to favor the Society with his opinion as to its applicability as a substitute for gutta-percha.

8. Specimen of a substance called "*Pwai-yet*" in the Tenasserim Provinces. *Presented by Sir A. Bogle.*

"It is procurable"—observes Sir A. Bogle—"at about one anna per pound. It has only to be moistened with earth-oil till of the consistency of paint, and then spread with the fingers on a bit of cloth on the cracks of a pukka-roof, to make them quite weather-proof, and to stop all leakage whatever, and it dries in an hour or two. I have found it quite invaluable, and I therefore beg to bring it to the notice of the Society."

Resolved,—that further enquiry be made regarding this substance, and its source of supply.

A recommendation from the Council that the sum of Rs. 200 be appropriated for obtaining a supply of Seychelles' cotton seed was submitted and adopted.

In connection therewith, Mr. S. H. Robinson, submitted, and the Rajah Pertaupchunder Sing, seconded the following proposition:—

"That the experiments in cotton cultivation in the Society's garden from American seed having proved very satisfactory, it is desirable to cultivate a sufficient quantity to ascertain the cost of production, and therefore that a plot of ground, not less than three beegahs, in the vicinity of the Society's garden, be leased for the above purpose, and that the cost of cultivation and preparation be carefully noted, and the produce sent for sale in the Liverpool market." Referred to the Council for report.

Horticultural Exhibition.

Read the following remarks of the Judges respecting the last exhibition of the season:—

"*Horticultural.*—The Judges beg to offer the following remarks on the exhibition held in the Town Hall on the 1st of April, 1857.

"*First.*—As regards exotic vegetables, it may be observed, that there were a few bundles of asparagus of a large, young and tender description. Of globe artichokes two kinds were well represented. There were several baskets of beans,—viz: Windsor, long-pod, Lima and French. Of beet some good specimens were submitted of the long red and turnip-rooted kinds. The Early York, Battersea, drum-head, red and Savoy cabbages were all abundantly represented, and in good condition. Of carrots, of the long-red, large yellow, early and short horn varieties, there were several baskets, all well raised. Of lettuce and endive the collections were but small, but the quality was very good. Herbs, in both a green and dried state, of good quality, were submitted. There were a few good specimens of horse-radish. The turnip-rooted and long radishes were abundant, young and tender. Scotch kale was but poorly

represented on this occasion. Many baskets of potatoes of four kinds were submitted in different stages of maturity, all of good quality save one, which was a little diseased. Of turnips, the white flat, yellow stone, and globe were in excellent condition, notwithstanding the lateness of the season. The same remark is applicable to nolo-kole. In addition to the above, specimens were submitted of the following: tomato, maize from North American stock, ginger (West Indian), onions and leeks, triple-curved parsley and water-cress: there were good specimens of all these. Of peas two small baskets full were shown in excellent order, although so very late in the season. The sulphur and white brocoli were pretty plentiful, and of good quality.

"*Second.*—Of Native Vegetables the show was well supplied with bringals, sags, yams and beans of various kinds.

"*Third.*—In the fruit department the collection was good, consisting among other specimens, of bail of three kinds, guavas, limes of three kinds, several baskets of loquots, melons, and mulberries of three kinds; of pomegranates the quantity was small, but the quality very good; of pine-apples the display was large, but the quality indifferent. Pummelows of three kinds were well represented. There were several baskets of peaches, but the quality was bad, owing to the fruit having been plucked while green, and then forced. Of sapotas there was a fair quantity, and of good quality. Two baskets of good soursops were submitted. Of strawberries there was only one plant in a pot, bearing a few small fruits. Besides these were specimens of rose-apples, papiabs, plantains, &c., &c. There were some good cocoa-nuts from Singapore and Ceylon stock; also a few good bundles of sugar-cane apparently from Mauritius and Singapore stock.

"The show was altogether satisfactory, equal, if not superior, to that of last year. About 85 gardeners competed for prizes, which were awarded, to the amount of Rs. 190, to 43, as per annexed list in detail.

WM. G. ROSE.

PEARY CHAND MITTRA.

ST. DOUGLAS.

JOSEPH AGABEG."

"*Floricultural.*—In submitting the annexed detailed list, the Judges have to offer a few remarks respecting the last show of the season held on the 1st April.

"The number of plants exhibited, it may be observed, were about the same as at the show of the 4th April, 1856, but the competition was not so great, there being 20 contributors on that occasion, and only 14 on this; while prizes aggregating Rs. 100 were given at that show to 14 malis, but to 9 only at this, to the amount of Rs. 87.

"As was to be expected, the orchids formed the chief attraction. Eight gardens contributed towards this department, including the H. C. Botanic, and the Society's Garden, the produce of both which, however, was sent for exhibition only, not for competition. Among those from the Botanic Garden

came beautiful examples of *Phalænopsis amabilis* from Manilla and *Renanthera coccinea* from China ; also two species of *Erides*, red and pink flowered ; a new species of *Calanthe* ; *Dendrobium aggregatum* and *densiflorum*, all from Assam ; likewise *Epidendrum crassifolium*, and *Eulophia virens*. The Society's Garden shewed a beautiful specimen of *Dendrobium Paxtoni*, and a well-grown plant of *Dendrobium densiflorum*. Mr. Warwick's garden contributed 14 kinds, including a new species of *Dendrobium*, and fine specimens of *Dendrobium cerulescens* and *Wallichianum* ; also *Phalænopsis amabilis*, *Renanthera coccinea*, and *Ornithochilus nebulosus*. In the collection of 7 kinds from Mr. R. F. Ross' garden, there were two new species of *Dendrobium* from Burmah, and a *Phalænopsis amabilis*. From the Rajah Nursing Chunder Roy's garden came 5 kinds, including an exceedingly well-grown plant of *Oncidium luridum*, also specimens of *Oncidium flexuosum* and *Phalænopsis amabilis*. Baboo Kissory Chand Mittra shewed a specimen of *Dendrobium*, nearly allied to *Pieradii*, but of a more upright habit.

" In the class of novelties were good specimens of *Pleroma Tisanerva*, and of a Liliaceous plant raised from Texas seed, both from the garden of Rajah Nursing Chunder Roy ; also a new species of *Cyrtoceras*, and some well-grown plants of *Delphinium Chinense*, from Mr. Warwick's garden ; and a specimen of *Allamanda nerifolia* from the garden of Mr. F. Pereira.

" There were but few plants in the general collection deserving of notice. There were good assortments of *Anuryllids* from the gardens of Messrs. R. Wood and R. F. Ross ; some well-grown plants of *Stephanotis floribunda* contributed by the gardens of Mr. Poe and the Tank Square ; a splendid example of a white flowered *Ixora* contributed by Mr. Ross, and a fine collection of double-pinks from the Society's Garden.

" The prizes were distributed by Baboo Peary Chand Mittra, Vice-President.

BENJ. WARWICK.

SAM. PRYCE GRIFFITHS.

A. GROTE."

Nursery Garden.

Read the Gardener's monthly Report of which the following are extracts :—

" In submitting my report for the month of March last, I have now the pleasure of forwarding a tabular statement of the pea crop for the season 1856-57, from which it will be seen that the American peas, which yielded but a poor per-centage when sown in gumlahs last July, did not germinate at all when sown in the open ground in November following, and that some of the kinds came up, but produced no seed, although the plants made a healthy growth, and were in every way cultivated like those which have given a good return.

" The arrow-root (79 seers), tapioca powder (5 seers) made from the surplus tubers grown in the garden last year, and which have been forwarded to the

office for distribution to the members, will I hope turn out equally as good as that prepared in the garden in former years.

"The American sumach trees (*Cosalpinia coriaria*) have yielded a heavy crop of seed this Spring, part of which is now forwarded for distribution to the members.

"It may also be worth remarking that the seed of the Chinese rice-paper plant (*Aralia papyrifera*) produced in the garden at the close of last year, has yielded seventy per cent. from the seed sown in the garden, on purpose to know whether the seed would germinate or not.

"Ten of the twelve kinds of tree and shrub seeds presented to the Society by Capt. Lowther of Assam, have germinated freely.

"The plant of *Magnolia grandiflora* contributed by F. Pereira, Esq., in 1853, has flowered this season for the first time in the garden, and, as will be seen from one of the cut flowers now forwarded, that it is a most exquisite and sweet-scented flower.

"In conclusion, I may state that out of thirty different kinds of the *Brassica* tribe grown last year in the garden on a rich and well manured plot of ground, and well attended to with water during the whole season, on purpose to produce seed if possible from them, the three following kinds flowered, viz. :—cauliflower, brocoli, and Scotch kale : the other twenty-seven kinds, being all cabbages, not one showed the least signs of producing seed ; the Scotch kale ripened a little seed, but the cauliflower and brocoli were attacked by green fly, while in full flower, and destroyed, although tobacco water was used to kill the fly."

Communications on various subjects.

The following letters were likewise submitted :—

1. From Secretary, Government of Bengal, forwarding, with reference to previous correspondence on the subject, indents for seeds for the use of soldier's gardens in various parts of the country.

The Secretary mentioned that steps had been taken to meet this requisition.

2. From Captain W. H. Lowther, Assam Light Infantry Battalion, dated from Suddiya, 28th February, an interesting communication on various subjects.

3. From Hodgson Pratt, Esq., late Inspector in the Department of Public Instruction, Lower Provinces, acknowledging receipt of the recently printed number (Part VI, of Vol. 1) of the *Indian Agricultural Miscellany*, in Bengali. Mr. Pratt remarks—"I think it a publication of the highest value. I have distributed a considerable number of copies of previous Parts in the several districts which were visited by me in my capacity of Inspector of Schools ; and some interest in the work has been shown by the people (zemindars and others) in the interior. Much greater interest will be felt when the Education

Department takes up the subject of instruction in the principles of agricultural chemistry."

4. From E. W. Moloney, Esq., Magistrate of Jessore, intimating in reply to the Society's circular that he has made enquiries among the *malis* in his district, whether they are willing to accept the terms offered by the Society, and finds that no one wishes to go alone, but that if two would be taken, he could send them down.

Resolved,—that this matter lie over for the present, till replies are received from the Magistrates of other districts.

5. From J. C. Murray, Esq., Serampore, dated 7th April, reporting on the fibre of *Daphne mucronata*, which has been sent down by Captain Briggs as a probable good material for paper manufacturing:—

"I have carefully examined the sample of the *Daphne* fibre sent me. It seems to me to be admirably adapted for making good serviceable strong paper, but before this can be done, it will require to be better prepared and cleared from bark than the present sample. The cost of carriage from the hills would raise its cost too high to allow of my using it here; but I see no reason why it should not be profitably employed on the spot, either for paper making, or spinning into yarn and weaving. I can try it both ways if you could get me about ten maunds of it."

Ordered, that a copy of this report be sent to Captain Briggs.

6. From D. Hanbury, Esq., London, dated 19th February, acknowledging receipt of a further supply of the root of "*Atees*" (*Aconitum heterophyllum*) "I wish I could tell you,"—writes Mr. Hanbury—"that I was likely to make an useful application of the drug which you have taken so much pains to place at my disposal. I must say, however, that for any successful chemical examination of such a substance many pounds' weight are generally required; but even if we had this quantity, it is very questionable, judging from the known properties of the root, whether the result obtained by chemical analysis would at all repay the time and labour it would demand. Thinking some medical men might feel disposed to give the "*Atees*" a trial here, I brought the subject before the *Pharmaceutical Society* on the 5th November, 1856, as you will see if you refer to the *Pharmaceutical Journal and Transactions* for last December, page 311. No one, however, has applied for a supply of the drug."

7. From H. Cope, Esq., submitting a small block of wood of the wild olive, to compete for the prize for a substitute for Turkish Box.

8. From C. E. Davies, Esq., Superintendent Behar Industrial Institution, returning thanks for the offer of cereal and other seeds;—seeks information respecting works on agriculture in Oordoo.

The Secretary stated that he had sent Mr. Davies a copy from the Society's library of Fenwick's *Hand-Book of Agriculture*, the only work available in Oordoo.

Proceedings of the Society.

(13th May, 1857.)

W. G. Rose, Esq., senior member present, in the chair.

The following gentlemen were elected members :—Messrs. H. T. Raikes, P. Carnegie and George May, Captain W. H. Oakes, Captain J. S. Davies, Lieutenant Swanston and Baboo Puddumlochun Mundul.

The following gentlemen were proposed as members :—

Captain J. C. Haughton, Magistrate of Tavoy ;—proposed by the Secretary, seconded by Mr. Grote.

Baboo Khalutch Chunder Ghose, of Calcutta ;—proposed by Baboo Peary Chand Mittra, seconded by Rajah Pertaub Chunder Sing Bahadoor.

W. Johnston, Esq., Civil Service, Shajehanpore ;—proposed by the Secretary, seconded by Mr. W. G. Rose.

E. DeCruz, Esq., Financial Department, Calcutta ;—proposed by Mr. S. F. Seymour, seconded by Baboo Peary Chand Mittra.

Rajah Sutish Chunder Roy, Rajah of Nuddea ;—proposed by Mr. Grote, seconded by Mr. C. A. Cantor.

Major J. G. Holmes, Commandant 12th Irregular Cavalry, Segowlie ;—proposed by Major-General Hearsey, seconded by the Secretary.

Rev. Thomas Smith, of the Free Church Institution ;—proposed by Baboo Peary Chand Mittra, seconded by the Rev. J. Long.

J. W. H. Campbell, Esq., of Calcutta ;—proposed by Mr. G. L. Young, seconded by the Secretary.

G. O. Wray, Esq., Solicitor, Calcutta ;—proposed by Mr. C. A. Cantor, seconded by Mr. C. E. Cresswell.

Baboo Bissumbhur Sing, Zemindar, Beerbhoom ;—proposed by Baboo Peary Chand Mittra, seconded by Baboo Shib Chunder Deb.

The following contributions were announced :—

1. Two large size flower stands. *Presented by R. Blechynden, Esq.*

2. Specimens of lac wax, of molasses from the date tree, of farina from the Tenasserim yam, or "*Sooshnee aloo*," (*Dioscorea fasciculata*) and seed of a species of *Datura* brought from the Fort of St Salvador in S. America. *Presented by Dr. George Evans.*

Dr. Evans submits some interesting remarks regarding all these specimens ; these papers were transferred to the Committee for publication in the next number of the Journal. The *Datura* seed is available to members.

3. A small but valuable collection of 14 plants from Australia, consisting of *Araucarias*, *Dacrydium*, *Grevillea*, &c. *Presented by C. B. Stewart, Esq.*

4. A few grafts of *Cordia Sebestena* of the variety yielding a bright scarlet flower, seeds of the same and of *Poinciana regia*. *Presented by Andrew D'Cruz, Junior, Esq.*

5. Seeds of *Amherstia nobilis*, *Poinciana regia* and *Bombax Gossypium*. *Presented by Mr. Sharp, Superintendent of the Barrackpore Park.*

6. A supply of seeds of *Colvillea racemosa*. Received from Mr. Robert Scott, of the H. C. Botanic Garden.

Portions of all the above seeds are available to members.

7. A small quantity of Egyptian cotton seed for trial in the Society's Garden. Presented by James M. Hall, Esq.

8. Lithographed copies of his designs for three of the Pegu cantonment gardens. Presented by Mr. R. Scott.

Mr. Scott, also submitted for the inspection of the meeting, a neatly executed copy of his design for a public park at Rangoon.

9. A kettle as a specimen of common Pegu pottery. Presented by Messrs. Charles Cantor and Co. on behalf of Major Phayre, Commissioner of Pegu.

10. Sample of an oil yielding seed from Gorruckpore, called "*Tewra*," and of oil expressed from it. Presented by William Peppe, Esq.

11. Sample of essential oil obtained from a grass covering all the hills near Benares and Mirzapore. Presented by Dr. A. H. Cheek, Civil Surgeon, Benares.

(Further particulars regarding these oils will be found in the body of the proceedings.)

The following specimens from the Society's Garden were also placed on the table :—

A. Two fruit raised from seed of the "Calabash pumpkin," presented by James Cowell, Esq., in November, 1856.

The larger of these specimens weighs upwards of 20 seers.

B. Specimens of 5 kinds of potatoes, viz. :—

1. White potatoes, received from Cherra, the produce of Madras seed sent to Mr. C. K. Hudson.

2. Red potatoes, received from Cherra, the produce of California stock, sent to Mr. Hudson.

3. Purple seedling potatoes from Van Dieman's Land, received from Captain Harris of the *Barque India*.

4. Yellow potatoes from English stock, received from Mr. Dean of Howrah.

5. Potatoes from Darjeeling stock, received from the Rev. Dr. Boaz. All these potatoes have degenerated in size, but the quality is excellent, more especially that of Nos. 1 and 2.

Nursery Garden.

The Gardener's monthly report was read. Mr. McMurray announces that the severe storm on the night of the 7th of May caused some injury in the Garden. "Of fruits, nearly all the mangoes, peaches and pummelows, in an unripe state, were shaken off the trees; the whole of the plantain plantation was levelled to the ground, destroying more than one hundred branches of fruit-bearing plants and others coming into flower. The lime and lemon trees in a bearing state were much damaged, but on them there is still remaining a fair crop. Of the rose-apple fruit nearly all were knocked down.

None of the large fruit trees suffered much damage, except the fruit and some small branches being broken, but many of the young trees were much shaken at the roots, and a few thrown on their sides, which have, however, been again upraised, and apparently sustained but little damage. The pine-apple plants in a bearing state were much knocked about, but none of the fruit broken off:—the plants have again been erected, and are looking well at the present time, but if dry scorching weather set in, I fear many of them will die. Of the grafted plants in pots, and attached to the trees, a few mangoes, peaches, and roses were broken off where the junction took place. The small conservatory was also blown down, but little or no damage was done to the pot-plants underneath it. One half of the coolies' lines was also knocked down, but fortunately none of the men sustained any injury;—the thatched buildings generally suffered more or less damage. Since the late rains I have been busy getting the garden cropped with the different kinds of rainy season crops, among which is the experimental cotton seed raised in the garden from the Eddisto Island, Melbourne, and imported Sea Island stock, of which I will have sufficient seed and plants to plant the three beeghas of ground as proposed at the last meeting. The ground and situation selected for this experiment is equal in quality to any in the garden or its vicinity, and has been well cultivated and manured previous to setting out the plants, so that there may be a fair trial made of the produce yielded with that of the first year's produce. It may be as well to state that the plants now set out were raised from the seed produced by the plants the cotton of which was reported on in 1856 by the Cotton Committee to have degenerated considerably from the original stock grown in the garden. The fact is, the ground on which the cotton was grown in 1855 had not received a top-dressing of any kind previous to planting, nor during the whole growth of the plants, and the soil in this plot was of two kinds, one part of it was very sandy, and contained little vegetable matter, while the other was of a black loamy nature, on this the plants grew best and produced the finest cotton, while on the sandy part of the plot the plants did not grow so rank, but produced an abundance of small pods, the cotton of which was inferior to that produced on the black soil; this accounts for the difference observed in the sample reported on in April, 1856, by the Cotton Committee." Mr. McMurray adds that the New Granada Paddy received in April has been twice sown, but as yet none have germinated. He concludes his report by a notice of several contributions, including 5 plants from Aden, presented by Captain Patterson of the P. and O. Company's service.

A report was brought up from the Garden Committee suggesting a remodeling of the flower-garden, with the view of saving labour, and improving its general appearance. The Committee also recommend the formation of a new ghaut and barrel drain, both which are urgently needed; further, the purchase of another cart and a pair of bullocks, to aid in conveying manure from

Howrah, of which a quantity has been already obtained, but much more is required. The total expense is estimated at Rs. 300.

Resolved,—on the recommendation of the Council, that the Report be adopted.

Read a letter from Mr. McMurray, tendering his resignation of the office of Head-Gardener, in consequence of his having obtained more lucrative employment in one of the Cachar Tea Companies.

Read also the following minute of the Council :—

“The Council, in submitting to the meeting this letter of resignation, desire to record their sense of Mr. McMurray’s useful, zealous and faithful labors, extending over a period of seven years, and to express their regret at the loss of his services to the Society.”

Proposed by Mr. S. H. Robinson, seconded by Mr. Joseph Agabeg, and unanimously *resolved*, that the meeting adopt the above minute of the Council, and that a copy thereof be communicated to Mr. McMurray.

The Secretary submitted, on behalf of the Council, a report from the Garden Committee recommending the steps necessary to be taken towards filling up the vacant situation.

Resolved,—that this Report be adopted, the Council notifying the result to the next General Meeting.

Indian Agricultural Miscellany.

A Report was read from the Translation Committee, announcing that Part VI of the “*Indian Agricultural Miscellany*” in Bengali, completing the first volume, has been issued from the Press; and that they purpose commencing on an early date, on the first part of the second volume. The Committee recommend a reprint of Parts II and III, which are out of print. They also recommend that a certain number of copies of the entire volume, be placed at the disposal of certain official authorities and public bodies, with the view of making the work more generally known: further, that Part VI be sold to members and the public at 3 annas a copy (or half the cost price), and that the price of the six Parts together be 12 annas, or separately 2½ annas a copy. The Committee recommend, in conclusion, that a selection from the first volume be made and printed for the use of Vernacular schools, &c., if there is a good prospect of its being sold.

On the recommendation of the Council, the report of the Committee was adopted.

Oil from the Tewra Seed, and from a description of Grass.

Read letters from Mr. Peppe, of Gorruckpore, and Dr. Check, of Benares, regarding the samples of oils above alluded to, as also minutes of the Committee regarding them.

Ordered, that copies of the above reports be sent to Mr. Peppe and Dr. Check, and that the former be requested to send down a few gallons of the

Tewra oil, for transmission to Mr. Wilson, manager to Price's Patent Candle Company's Works.

The motion of which notice was given at the last meeting, relative to the leasing of 3 beegahs of ground outside the Society's Garden as an experimental cotton plantation, was reported on by the Council, to the effect that sufficient ground was available for the purpose in the Society's Garden, and that a portion of it had been already planted out, as notified in the Gardener's Report. Disposed of accordingly.

Communications on various subjects.

The following letters were also submitted :—

1. From Major A. P. Phayre, Commissioner of Pegu, furnishing, in reply to the Society's request, some information regarding the production of palm sugar in that province. Referred to the Committee of Papers.

2. From the Secretary, Society of Arts, London, in reference to the various kinds of straw forwarded last year, with the view of ascertaining their applicability for paper-pulp, &c.

3. From George E. Evans, Esq., offering his services to the Society as Agricultural Chemist, and stating his antecedents in Ireland, and forwarding certificates.

The Council, in submitting the above letter, state, that they consider the subject a very important one, and would desire to offer Mr. Evans every encouragement in their power, and with the view of endeavouring to turn his knowledge of agricultural chemistry to practical account, suggest that he furnish a list of his charges for analyses for the information of the members of the Society.

Resolved,—accordingly, and that the list be submitted at the next general meeting.

4. From Captain W. H. Lowther, Suddiya, Upper Assam, dated 28th March, acknowledging receipt of two glazed cases of plants from the Society's Garden, and advising despatch of certain seeds and articles of interest. Captain Lowther also offers some remarks on horticultural matters.

5. From W. J. Longmore, Esq., Magistrate of Rungpore, intimating his inability to aid the Society in obtaining a *ma'i* from his district to be trained in the Society's garden.

6. From James M. Hall, Esq., expressing his readiness to endeavour to procure through his correspondents at Mauritius, a quantity of Seychelles cotton seed, as agreed on at the last general meeting.

7. From Captain H. Ternan, Deputy-Commissioner, Nursingpore, (Saugor and Nerbudda Territories) applying for foreign cotton seed and sugar-cane for trial in his district.

Resolved,—that this application be met in the proper season, as far as the means of the Society will admit.

(10th June, 1857.)

Baboo Peary Chand Mittra, Vice-President, in the chair.

The following gentlemen were elected members :—Captain J. C. Haughton ; Baboo Khalutch Chunder Ghose ; Messrs. W. Johnston, C. S. and E. DeCruz ; Rajah Sutish Chunder Roy ; Major J. G. Holmes ; Reverend Thomas Smith ; Messrs. J. W. H. Campbell and G. O. Wray ; and Baboo Bisumbhur Sing.

The following gentlemen were proposed as members :—

Lieutenant-Colonel J. A. Crommelin, Darjeeling ;—proposed by Mr. Stewart Douglas, seconded by the Secretary.

Wells Butler, Esq., C. S. Gya ;—proposed by Mr. W. Blundell, seconded by Mr. W. G. Rose.

Baboo Shorodapersaud Roy, Zemindar, Chuckdegye, Burdwan ;—proposed by Baboo Peary Chand Mittra, seconded by Rajah Pertanb Chunder Sing.

Philip Blyth, Esq., Merchant, Calcutta ;—proposed by Mr. James Church, seconded by Mr. G. B. Robinson.

George Field, Esq., Sub-Deputy Opium Agent, Arrah :—proposed by Mr. D. Cunliffe, seconded by the Secretary.

Edward Mohr, Esq., Merchant, Arracan ;—proposed by Captain F. W. Ripley, seconded by Mr. C. A. Cantor.

Baboo Kalee Prosono Sing, Calcutta ;—proposed by Baboo P. C. Mittra, seconded by Baboo Ramgopal Ghose.

The following contributions were announced :—

1. Selections from the Records of the Government of India, No. 22, and of the Government of Bengal, No. 25. *Presented by the Government of Bengal.*

2. Journal of the Asiatic Society of Bengal, Nos. 1 and 2 of 1857. *Presented by the Society.*

3. Selections from the Bethune Society's Papers, No. 3. *Presented by the Society.*

4. Specimens of Jaggery manufactured in the districts of Prome and Henzada in the Pegu province, from the juice of the Palmyra tree (*Borassus flabelliformis*), and regarding which full particulars are given in his communication read at the last meeting. *Presented by Major Phayre, Commissioner of Pegu. Referred to the Sugar Committee.*

5. Two small specimens of wheat and barley raised in the Jail garden at Sandoway. *Presented by Capt. F. W. Ripley.* "They are, perhaps, hardly worth notice," observes Capt. Ripley, "except to show that the grain will grow at this place, which has been generally doubted. I have made arrangements with the Deputy-Commissioner at Prome for a supply of wheat for seed, and intend next season to sow four or five acres." Capt. Ripley adds,—“I have also tried ‘Urhur Dhall,’ which has come up well, but is not yet ripe. I am going

to ask you to send me in September a small quantity of each other kind of 'dhall' for trial as seed. They are not procurable here, and no dependance can be placed on that casually bought in the bazar at Akyab. If we can get them to grow here, it will be a good thing for the people, who now have to pay for one kind with another about Rs. 5 a maund."

The above specimens were transferred to the Grain Committee for report. It was also agreed that with the dhall seed a quantity of cereal and other seeds of field crops, expected from England in August, be sent to Capt. Ripley for experimental culture.

6. A collection of plants from Upper Assam consisting of *Hedychium*, *Alpinia*, *Hoyas*, ferns, and several epiphytal plants, such as *Pothos*, *Ardisia*, &c.; also an assortment of seeds of ornamental shrubs, climbers and trees, and a few specimens of drugs. Presented by Capt. W. H. Lowther.

Regarding two of the seeds in this collection, Captain Lowther writes as follows:—

"By the next steamer you will probably get a box containing fruits of that fine "*Garcinia*" (growing to a noble tree) called here "*Tekna*;" fruit very large like an apple, but most intensely acid, far more so than any lemon that ever was known. Also in the same box some of the local damsons or sloes. (*Prunus Jenkinsii*?) making famous jams or tarts, a beautiful tree, tall, straight stem, looking like a cherry, the foliage green, shining, likes heat and moisture evidently, no where *wild*—comes I think from the mountain ranges near us. Stone, or rather its kernel, so full of prussic acid from neglect in culture, that we never allow them to enter the cooking pot:—they should be carefully removed previous to preparing the preserves or tarts. I have used a few, however, as bitter *almonds* in custards, for which they are well adapted, with care in the quantity. I preferred sending you both the above in bulk and pulp—as the seeds might otherwise have proved a failure. That "*Prunus*" will make fine stocks for grafting any stone fruit you might be able to send me. Our potatoes are just dug, and in my opinion have *degenerated*: we require a new stock; I shall be truly obliged if you will send me a few good seedlings of a gigantic sort. The ryots here are keenly alive to the great benefits of agriculture, and have this year raised their price from Rs. 1-8 per maund (potatoes) to 2 Rs. I have not seen any land since quitting the Punjab with such promising qualities as Suddiyah. You cannot send me too many kinds of field crops. I want to grow enough linseed for a few gallons of drying oil, and introduce this Assamese article of demand to the people if I can."

Nursery Garden.

The Gardener's Monthly Report was submitted. He states the number and kinds of fruit grafts and layers in store with which to commence the approaching issue season. "Of mangoes and peach-grafts there are upwards of four hundred healthy plants of each kind, and of each eighteen sorts, besides a number of the former kind attached to the trees, which will be ready to be

removed in July next. Of pummelows, loquots, sapotas, wampees and bale grafts, layers and seedlings, there are more than one thousand healthy plants; of the avocado and dessert pears there are eighty-one plants; of vines of four kinds there are in pots and in the ground upwards of one hundred plants; and of the American apple trees there are nineteen plants of five kinds. Of figs there are twenty-three plants, and of lemons, limes, oranges and citron layers there are upwards of three hundred plants. In addition to the foregoing there are the Otaheite apple, custard apple, rose-apple, long plum, jamrool, guava, bullock's heart, star-apple, and a few other kinds of fruit grafts, making in all more than three thousand fruit trees; besides the pine-apple plants of which there are a large stock in hand.

"Of dwarf flowering plants, trees and shrubs in pots there are upwards of thirteen thousand—besides from eight to ten thousand ready struck plants in the cutting beds and seed *gumla*s, as also a very large stock of seedlings ready for potting off so soon as the rains set in. The new cutting nursery has been laid out into beds, and in that there may be from twenty to thirty thousand cuttings put down during the rains, which will come in for issue during the latter end of the present season, and to commence next year's issue. Five *Victoria regia* plants have been planted out in the tank at the north end of the rosery, and are now well established. In addition to those planted out there are fourteen *Victoria* plants in *gumla*s, of which ten may be made available to any of the members desirous to cultivate the plant."

Indian Agricultural Miscellany.

The Rev. Mr. Long, laid before the Meeting the following circular, a copy of which had been recently addressed to him, by H. Woodrow, Esq., Inspector of Schools; "I have the honor to bring to your notice a valuable periodical, which has not yet received that share of public support, to which it is justly entitled. I allude to the "*Indian Agricultural Miscellany*." It is written in Bengali. The language used is clear and simple. The subjects treated of are, as the title suggests, agricultural. The price is exceedingly low, being only two annas each for the first five numbers and three annas for the sixth, while the size is medium octavo.

2. I have the honor strongly to recommend the Periodical to the notice of all School Committees as a Library Book. Applications may be addressed directly to, "the Secretary of the Agricultural Society, Metcalfe Hall, Calcutta."

Read a letter from Mr. Stewart Douglas, resigning his seat in the Council, and in certain Committees of the Society, consequent on his approaching departure from India.

A recommendation was submitted from the Council, for consideration at the next meeting, in accordance with Section 5 of Chapter X of the Bye-Laws, that Mr. George May be elected to fill the vacancy in the Council. It was

further proposed by the Council and resolved that Mr. S. P. Griffiths fill the vacancies in the Garden and Finance Committees, and Mr. D. H. Freeland, the vacancy in the Cotton Committee.

Communications on various subjects.

The following letters were also submitted :—

1. From H. G. French, Esq., suggesting that information be obtained respecting the mode adopted in the Madras Presidency of drying the Indigo leaf and manufacturing it into Indigo.

2. From J. F. MacLagan, Esq., Secretary A. and H. Society, Madras, enclosing a letter from Mr. Fischer, of Salem, in reference to Mr. French's enquiry.

3. From the Rev. C. S. Parish, Moulmein, affording some interesting and useful information regarding the substance ("Pwai-nyet") presented by Sir A. Bogle at the April Meeting; sending a specimen of it for identification, as also the small bee which produces it.

The above communications were referred to the Committee of Papers. It was agreed to sent a sample of the Pwai-nyet to the Society of Arts for report.

4. From G. W. Henning, Esq., Oorai, enclosing copy of certain reports, from Dr. Balfour, on the merits of the drug "*Atees*" in hospital and private practice, and asking for the prize which he supposes (erroneously) has been offered by the Society for an efficient substitute for quinine.

5. From Lieutenant R. Stewart, dated May 10, a few items of information regarding tea-planting in Cachar:—

"There is nothing to write to you about from Cachar except tea, and I have not been out to any of the plantations for a long time. But from what I hear the seedling plants are getting on first rate. The planters now, however, acknowledge having made two grave mistakes, the one in clearing off all shade from the lands they prepared for cultivation, and the other in having for the most part chosen lands to plant, which had previously been cleared, cultivated, and abandoned by the Hill tribes, such lands being less expensive in clearing a second time. It seems that the tea plant requires the full nourishment of a virgin soil, and that the seedlings cannot do without shelter for at least half the day. A succession of showers and sunshine has stimulated vegetation, and the leaves are fast appearing on the old trees, so manufacture on a small scale has already commenced."

6. From the Secretary Government of Bengal, enclosing further indents for seeds for Soldiers' Gardens at Dugshai and Dum-Dum.

7. From the Secretary Dacca Museum, asking for copies of the Society's Journal.

8. From the Secretary Local Committee Public Instruction, Barrackpore, applying for copies of the "Indian Agricultural Miscellany" in Bengali, for the Library of the Barrackpore School.

Agreed that these applications be met.

9. From Messrs. D. Landreth and Co. of Philadelphia; Messrs. Thomas Gibbs and Co., and James Carter and Co.; of London, advising despatch, respectively, of the Society's annual indents of vegetable, agricultural and flower seeds.

(15th July, 1857.)

Baboo Peary Chand Mittra, Vice-President, in the chair.

The proceedings of the last general meeting were read and confirmed, and the gentlemen proposed on that occasion elected members, viz :—

Lieut.-Col. J. A. Crommelin, Messrs. Wells Butler, P. Blyth, G. Field, E. Mohr, Baboos Shorodapersaud Roy and Kalee Prosonoo Sing.

The following gentlemen were proposed as members :—

W. Wagentrieber, Esq., Tea-planter, Debrooghur,—proposed by Captain W. H. Lowther, seconded by the Secretary.

Baboo Gobind Chunder Dutt, Merchant, Calcutta,—proposed by Baboo Ramgopal Ghose, seconded by Baboo P. C. Mittra.

W. Daunt, Esq., Peepra, Champarun,—proposed by the Secretary, seconded by Mr. W. G. Rose.

F. H. Sieveking, Esq., Engineer E. I. Railway,—proposed by Mr. C. Durrschmidt, seconded by the Secretary.

Pelloquin Cosserat, Esq., Babrowlee, Goruckpore,—proposed by Mr. B. R. Landale, seconded by the Secretary.

The following contributions were announced :—

1. Half-yearly report of the Committee of the Bengal Chamber of Commerce, April, 1857. *Presented by the Chamber.*

2. Journal of the Asiatic Society of Bengal. No. 3, 1857. *Presented by the Society.*

3. A few copies of an address to the Chamber of Commerce of Dundee, on Tropical Vegetable Fibres, by J. B. Sharp, Esq. *Presented by the Author.*

4. Meteorological Tables kept at Hobart Town, for January, February, and March, 1857. *Presented by the Royal Society of Tasmania.*

5. Sample of raw silk, the produce of the Sandoway district. *Presented by Captain F. W. Ripley.*

Captain Ripley states that this is an average sample, and the price varies from 10 to 12 Rs. per viss of 140 tolas. Referred to the Silk Committee.

6. Three small glazed cases containing 35 olive grafts. *Received from Dr. Gibson, Superintendent Botanic Garden, Bombay.*

Of these grafts, the Gardener reports that 17 are in a healthy condition, 9 sickly, and 9 dead.

7. Three grafts of a China mango. *Presented by Mr. Sharp, Superintendent of the Barrackpore Park.*

The recommendation of the Council, of which notice was given at the last meeting, that Mr. George May be elected to fill the vacancy in the Council, caused by Mr. Stewart Douglas' departure from India, was submitted and unanimously agreed to.

A recommendation was also submitted from the Council, for consideration at the next meeting, that Mr. C. B. Wood fill the vacancy in the Council caused by the departure of Mr. B. Warwick.

Nursery Garden.

A report was submitted by the Garden Committee of a recent visit to the Garden, of which the following are extracts :—

“The Committee report that Mr. J. Manuel having been appointed to the temporary charge of the Garden, Mr. McMurray transferred it to him on the 6th instant, together with all the property belonging to it.

“The Garden is altogether in good order. The young cotton and cane plants look remarkably healthy; the plots were previously well manured. Nearly the whole of the ground not occupied by the orchard, kitchen-garden, and flower-garden, has been cropped with fibre-yielding plants, arrowroot, tapioca, Guinea-grass, and other useful products. As the labor of keeping these plots in order will be comparatively light for the next three months, and as but little watering will be needed during the same period, the Committee have instructed the Officiating Gardener to discharge eight of the *Dhanger* Coolies, from the 1st proximo; the establishment will even then be larger than it was at the close of last year.

“The *pucka ghat* to the east of the tank adjoining the large banian tree, which was recommended to be made in the Committee's last report, is nearly completed; the new beds to the north of the banian tree, have been recently well stocked with cuttings. The smaller of the conservatories has also been taken down, and that portion of the garden opened out.

“The Committee recommend that the alteration in the flower garden, recommended in their last report, be postponed for another season, or till the arrival of a new Gardener.

“The Committee have to advise the receipt, in tolerable good order, of 3 glazed cases of olive grafts forwarded by Dr. Gibson from Bombay, they have directed that these be carefully tended till the cold season when, perhaps, the majority can be despatched to localities suitable for their culture.

“It having been brought to the notice of your Committee, that certain Members have obtained fruit grafts, at the reduced rates, for the benefit of non-subscribers, your Committee beg to suggest that, in future, Members applying for such grafts be requested to state that they are intended *bonâ fide* for their own use.”

In connection with the above the Council recommended that Mr. Manuel be allowed to draw Rs. 125 per mensem, while in charge of the Garden. Agreed to.

A Report was read from the Grain Committee on the specimens of wheat and barley, the produce of Sandoway, which were received from Captain Ripley, and submitted at the last Meeting. The Committee consider the wheat of fair sound quality, it is what is called "*Gungajelly*," with some mixture of "*Jamally*." Such wheat ordinarily sells at Rs. 1-8 to 1-10 per bazar maund, but at present, (28th June,) would fetch as much as Rs. 2-5 to 2-6, the market being quite bare. The barley sample is considered of a superior quality, being bold, plump and well grown; it would fetch at present Rs. 1-8 to 1-10, but the usual range of prices is from 12 annas to one rupee.

Ordered that a copy of this report be sent to Captain Ripley.

Letters were also read:—

1. From the Secretary Government of Bengal, applying, on behalf of the Government of Madras, for information on the subject of rearing of silk-worms and the production of silk.

The Secretary stated he was collecting the required information.

2. From Dr. Mouat, applying for fruit grafts of all sorts for a large garden at Baraset recently established by the Magistrate of that district.

Resolved—that these grafts be furnished at the lower scale of prices.

3. From the Secretary Local Committee Public Instruction at Baraset, returning thanks for copies of Journal and for seeds supplied for the garden attached to the Baraset School: also submitting extracts from the Report of the Baraset School for the year 1856-57, of which the following are portions:—

"The agricultural class received lessons from Lindley's Theory of Horticulture, and worked in their own gardens on the farm. Twenty plots of ground, each about a cottah in area, were assigned to them, where they raised, unassisted by *mallees* in any way, peas, beans, cabbages, endives, cress, tomato, lettuce, water-melon, gourd and other cucurbitaceous plants. They reared also such plants as *Russelia*, *Jatropha*, *Balsam*, &c., but they did not succeed in cultivating parsnip, salsify, and asparagus; and even of those plants which grew in their gardens, very few, it must be confessed, reached that degree of perfection which could alone elicit praise from visitors. The following vegetables may be said to have succeeded:—peas, endives, cress, tomato, turnips, mustard and tobacco.

"As these boys do not belong to that class of people who look to agriculture as their ultimate aim in life, they naturally pay less attention to this branch than to their other studies. Besides, the masters are overburdened with other very onerous duties, which do not leave them that degree of leisure which can alone make success possible, in a field where they have every thing to do for themselves. The high-caste Hindoos look with disdain on agricultural pursuits, and even consider them as forbidden by their Shastras. It is enough that in Baraset this silly prejudice has been overcome, and that sons of Boidhos and Brahmins fearlessly hold the plough and till the ground.

The general garden kept up by *malees* is in progress. The improvements effected in it during the year were the construction, in part, of a puckah road on all sides of the tank, the laying out in an ornamental style the spot of ground on the south of the tank, and the addition of the following plants:—Indian tamarisk, wing leaved *Ipomea*, *Michelia champaca*, *Spondias mangifera* (best sort), *Areca catechu*, *leechees*. Crops produced were arrow root, millet, ginger, paddy, sugar-cane, country potato, Chinese potato, maize, coriander, mustard, patul, brinjal, &c. A specimen of China potato produced in this garden having been forwarded to the Agricultural and Horticultural Society of Calcutta, was laid before their general meeting in February, 1857, and has met with a favorable notice in their proceedings.

“In the latter part of September last, Cape and Scotch vegetable seeds and English flower seeds were received from the Agricultural and Horticultural Society of Calcutta, to whom the Committee take this opportunity of tendering their cordial thanks for such aid. Most part of the vegetable seeds were tried with success by the boys as well as *malees*, but the flower seeds could not be made to germinate even at the second attempt. The lateness of the season when the sowings commenced, may be assigned as one cause of this partial failure.”

(19th August, 1857.)

Baboo Peary Chand Mittra, Vice-President, in the chair.

The proceedings of the last general meeting were read and confirmed, and the gentlemen proposed on that occasion elected members, viz :—

Messrs. W. Wagentrieber, W. Daunt, F. H. Sieveking, P. Cosserat, and Baboo Gobind Chunder Dutt.

The following gentlemen were proposed as members :—

J. W. Bradbury, Esq., Kishnaghur ;—proposed by Mr. James Agabeg, seconded by Mr. R. H. Hollingberry.

Lieut. C. T. Hitchens, (late 54th N. I.) Executive-Officer, Dacca ;—proposed by Major Fleetwood Smith, seconded by the Secretary.

The following contributions were announced :—

1. Kane's Arctic Explorations, Vols. 1 and 2, and Lippincote's Pronouncing Gazetteer of the world. *Presented by Messrs. D. Landreth and Son.*

2. Selections from the Records of the Government of India, No. 23, (2 copies.) *Presented by the Government of India.*

3. Journal of the Indian Archipelago, Vol. I, Nos. 1 and 2, new series. *Presented by the Government of India.*

4. A pamphlet (2 copies) on increased supplies of cotton from India. *Presented by the British India Association.*

5. Meteorological Tables kept at Hobart Town for April and May, 1857. *Presented by the Royal Society of Tasmania.*

6. A large quantity of Cuba, Java, and Sandoway tobacco seed. *Presented by Captain F. W. Ripley.*

7. A bag of Hamburg peas. *Presented by Mr. H. L. Butler.*

8. Seeds of *Garcinia cornea*, an ornamental tree. *Presented by Mr. C. Sharpe, of the Barrackpore Park.*

9. Two specimens of gum collected by Mr. J. P. Meik, from trees known as the "Putmye" and "Rajmye," growing abundantly in the jungles of Cuttack. *Presented by G. F. Cockburn, Esq.*

Nursery Garden.

The Officiating Gardener's Monthly Report was read, of which the following is an extract :—

"The report for the previous month fully embraces all that can be said for the operations to be performed during the present season, as every available ground has been usefully laid out, and until the ensuing season no other operation can be progressed on.

"The work done during the past month has therefore been principally in grafting and layering fruit trees, and putting in layers and cuttings of the flower plants, as well as adding those ready to the stock. In the floricultural department I have on hand a great many plants both rare and useful as well as ornamental, and as an addition to these, I beg to say that I have received one hundred and eight descriptions, containing above three thousand plants, all useful and ornamental, from the Hon'ble Company's Garden, which with the others can be made available to the members.

"Of the entire number, there are 8 species of Palms, 3 of *Cordias*, 3 of *Sterculias*, 7 of *Bauhinias*, 3 of *Gardenias*, 2 of *Combretums*, 2 of *Eugenias*, 2 of *Nepheliums*, 2 *Echites*, 2 *Swietenias* (*Mahagoni* and *Choloroxylon*), 1 of *Triphosia trifoliata*, 2 *Cassias*, 3 *Acacias*, *Cinnamomum Zeylanicum*, *Chrysophyllum Canito*, 2 *Mimusops*, 2 *Garcinias*, and several others."

Mr. Manuel also submits a very favorable tabular statement of the germination of the American vegetable seeds received from Messrs, Landreth and Son, shewing a general average percentage of seventy-five, which is fully equal to any previous season.

Mr. Sharpe, the Superintendent of the Barrackpore Park, also writes in corresponding terms regarding these seeds; he says, "they are very good; I opened every packet myself, and would never wish for fresher or better seed; all so far as to-day have germinated well, many of them cent per cent."

Reports on Sugar, Raw Silk and Gum.

A report was read from a section of the Sugar Committee (Messrs. S. H. Robinson and James Cowell,) on the musters of "goor" prepared in the districts of Prome and Henzada from the Palmyra tree (*Borassus flabelliformis*) and submitted at a previous meeting by Major Phayre, the Commissioner of Pegu.

A report was likewise read from a section of the Silk Committee (Messrs. W. G. Rose and Joseph Willis) on the musters of Bassein raw silk submitted at the last Meeting by Captain F. W. Ripley, Principal Assistant Commissioner of Arracan.

A report from Dr. J. B. Barry was submitted on the specimens of gums from Cuttack received from Mr. J. P. Meik.

The Secretary in reading Mr. Meik's communication stated, that the specimen leaves of the trees yielding this gum had reached in too imperfect and decayed a state to admit of recognition.

Resolved,—that copies of the above reports be forwarded to the respective contributors: that Mr. Willis' suggestion of forwarding the Arracan raised silk to the Society of Arts be acted on; and that Mr. Meik be requested to send fresh specimens with flowers of his gum-yielding trees.

Read a letter from the Librarian to the Society of Arts and Sciences of Batavia, requesting an interchange of publications. Agreed to.

The recommendation of the Council, of which notice was given at the last meeting, that Mr. C. B. Wood, be elected to fill the vacancy in the Council caused by Mr. B. Warwick's departure from India, was submitted and unanimously agreed to.

(9th September, 1857.)

The Hon'ble Sir Arthur Buller, President, in the chair.

The proceedings of the last general meeting were read and confirmed, and the gentlemen proposed on that occasion elected members, viz:—

J. W. Bradbury, Esq., and Lieut. C. T. Hitchens.

The following gentlemen were proposed as members:—

Lieut. F. S. Stanton, (Engineers), Shergotty,—proposed by Captain C. H. Dickens (Artillery), seconded by Mr. C. A. Cantor.

C. A. Saubol, Esq., Nopara, Kishnagpur,—proposed by Mr. S. P. Griffiths, seconded by Mr. C. E. Creswell.

The following contributions were announced:—

1. Selections from the Records of the Government of Bengal, No. 26 (two copies). *Presented by the Government of Bengal.*

2. Maps of the Administration Report for the year 1855-56. Part 3, *Presented by the Government of India.*

3. Catalogue of the Geological Museum, in connection with the Geological Survey of India, Part 1, Minerals. *Presented by the Director.*

4. Meteorological Table, kept at Hobart Town for June, 1857. *Presented by the Royal Society of Tasmania.*

5. A large quantity of Mignonette seed. *Presented by P. Rayson, Esq.*

6. A specimen of the vinous extract of "Mishmee teeta" (*Coptis teeta*). *Presented by Captain W. H. Lowther, of the 1st Assam Light Infantry Battalion.*

The Secretary stated that specimens of several other articles had been enclosed in the same box, but they had, unfortunately, received such damage in transit by dawk banghy from Debrooghur, as to be quite worthless.

7. Specimens of eight kinds of paddy from the Sandoway districts; of a description of wood oil; of dried plantains; also a glazed case containing plantain trees, &c. *Presented by Captain F. W. Ripley, Principal Assistant Commissioner of Arracan.* (Further particulars will be found in the body of the proceedings.)

Nursery Garden.

The Gardener's monthly report was read, of which the following is an extract:—

“I will now draw your attention to a large stock of fruit trees in hand, viz.: loquots, custard-apple, rose-apple, star-apple, sapota, pomegranate, whampoe, bale, guava and cocoa-nut seedlings, the last is from the Singapore stock, and of a description well deserving the attention of both the members and non-members. The loquots and custard-apples are reared from stock which was judged to be the best in the fruit exhibition, and the first prizes awarded to them. These plants, with a little more than the ordinary care by *mallees*, can be reared to perfection, and the fruit yielding will assuredly be of the best kind that may be procurable in Bengal.

“I shall soon have ready a stock of lychees, mangoes, peach, pumplenose, orange and lime grafts, also apples and pears available, but as a limited number is made up for the stock for the ensuing season, it would be desirable for such members as are desirous to possess them to send in their names for registry. To this I may add a stock of various kinds of palm, which are well worth a place in any gentleman's garden.

“The Indian corn is ready, and within the week I shall have them cut and sent over for distribution to the members.

“In the Floricultural department I shall have a few plants (cuttings) of *Cissus discolor* ready and fit for distribution. I have put down a few more cuttings, and it would be desirable to have a few names of such members desirous of possessing them registered.

“There is now available about a dozen of the *Victoria regia* and a good number of assorted roses, both rare and good, also a variety of *Jasminum*, *Hibiscus*, *Passifloras* and some of the following—*Gloxinia maculata*, *Ardissia umbellata*, *Aralia papyrifera*, *Euphorbia jacquiniiflora*, *Colvillea racemosa*, *Jacquinia* species, *Abutilon Bedfordiana*, *Buxus* sps., *Eranthemum crenulatum*, *Lilium longifolium* and Mr. Fortune's China chrysanthemum.

“I have now to inform you that two of the *Colvilleas* are in flower for the first time this year. One of them is a plant raised from seed presented by Dr. Mouat in 1851, which has the most flower; and four of the eight *Victoria Regia* put down in the centre tank have also flowered.

Proceedings of the Society.

"In submitting the report on the Cape Vegetable Seeds of Messrs. C. M. Villet and Son, I beg to state that I found them as I opened each packet to be fresh and good, and judging from its result, I am of opinion that it is nearly as good as the American seeds from Messrs. Landroth and Sons. The accompanying tabular statement will shew the result of the trial sowing, which I think is satisfactory, as it yielded an average percentage of above sixty per cent. which I find to be fully equal to previous year's sowing.

"In conclusion, I regret to say that the present severe blowing has slightly injured the *Mammea Americana* presented by the late Mr. R. W. G. Frith, in December, 1848, and one of the *Colvilleas* planted near the Conservatory—they are both slightly up-rooted, but I have taken all the precautions necessary to hold them up. I have every reason to hope both will do well."

Communications were received:—

1st. From Captain W. H. Lowther, advising despatch of the specimens referred to among the presentations, and offering some interesting remarks respecting them:—

2nd. From Captain F. W. Ripley, regarding the plantain trees, specimens of paddy, &c., referred to among the contributions. In the first communication dated Sandoway, 22nd May, Captain Ripley writes as follows:—

"I have to-day despatched a Ward's case containing twenty-seven plantain trees to your address, and shall feel obliged by your presenting them to the Society in my name. I have filled up the rest of the box with some cuttings of the Shan potatoe, it is an excellent vegetable, sweet like a chesnut. The tuber grows to a large size, and is an elongated oval, pointed at each end,—it is propagated by cuttings the same as the common sweet potatoe,—I do not know whether you have it in Bengal, but I expect not; it is not known in the Akyab and Ramree districts, and the Chittagong *mallees* say it is not known there.

"The plantains are numbered from 1 to 24. There are nineteen varieties.

"No. 1, Is a very large sized plantain, called the Hnet-pyau-meng or royal plantain,—I have seen it fifteen inches in length, and as large round as my wrist, it is generally eaten roasted in the skin.

"No. 2, Is called Hpeegyan it has a thick rind;—of a darkish brown, and is a very pleasant fruit, being of a mellow sub-acid flavour.

"No. 3, Thenaisa,—this is a small sized fruit, but of excellent flavour and considered most wholesome both for adults and children—it is called the child's food.

"No. 4, Beela, a good plantain.

"No. 5, Nathaboo. This is a very rich luscious fruit.

"No. 6, Same as No. 2.

"No. 7, Byat Taus. This is a large well-flavoured fruit.

"No. 8, Tsengan. The Elephant tooth,—this is a very large plantain, but coarse.

"No. 9, Gyceswé. The hog-deer's tooth, is a long thin plantain of good flavour.

"No. 10, Magalce. This is a good fruit, but very mealy.

"No. 11, Mounghya. This is much liked, it has a pleasant sub-acid flavour; the skin is of a dead white, and very thick.

"No. 12, Peemwé, is also a sweet well-flavoured fruit.

"No. 13, Theelawa. This bears a very handsome bunch of large sized fruit, but it is not worth much as an edible plantain.

"No. 14, Wet Tsway, the boar's tusk, is an excellent flavoured handsome fruit.

"No. 15, Same as No. 12.

"No. 16, Rakoing knetpyauthee. The Arracan plantain, *Musa Arakanensis*, the same as I previously forwarded on account of the fibre. These plants I have sent from my own garden, the old trees yielding particularly fine fruit.

"No. 17, Same as No. 7.

"No. 18, Mounghet. This is much the same as No. 2, only darker in the rind.

"No. 19, Kyetkee. This is a very long and large sized plantain but coarse eating.

"No. 20, The same as No. 5.

"No. 21, May daulethé. This is a long narrow plantain, it grows in handsome bunches, and is a luscious fruit.

"No. 22, Same as No. 8.

"No. 23, Tsapouk. This a sweet fruit, but full of seeds.

"No. 24, Mounghne. This is another thick-skinned plantain, of good flavour."

In his second letter, dated 29th May, Captain Ripley states:—

"I send you by to-day's dak a box containing eight kinds of paddy, of the best kinds that are most popular in this district, namely, 'Aboungnee,' 'Bhya Yanceegree,' 'Konhyah,' 'Gnakewai,' 'Kolastee,' 'Toungthoogree,' and 'Paloungsa.' The 'Yanceegree' is a red rice, and 'Paloungsa' is a very small table rice. The Bhyat and Aboungnee are most liked. I have also enclosed a small tin box containing a specimen of dried plantains from the *Musa Arakanensis*, and another with a little of the cleaned table rice, and a bottle of a wood oil, called Eng Isee by the Burmese—it is different from the Gurjun, and is used as a preservative for wooden rails, the topsides of boats, &c. I have not been able as yet to procure a young tree of the kind to send up, but hope to do so next month with other specimens that I am collecting. The wood oil at this season sells for two annas the vis, which is about three rupees the bazar maund, but in the dry season in the circles to the Southward, right down to Negrais, it is procurable in large quantities, at about six rupees the 100 vis, or 365 lb English."

The Secretary intimated that the glazed case had, unfortunately, not reached him till 3 months after its despatch, and that during the greater part of

that time it had by mistake been kept in a godown : consequently, on opening the case, the contents were found to have entirely perished.

3. From Mr. J. McMurray, an useful practical paper on the cultivation of the Dahlia in Bengal. Referred to the Committee of Papers.

4. From Dr. Brandis, Superintendent of Forests, Pegu, applying for a small quantity of cotton seed of sorts, for trial at Pegu. Complied with.

5. From Messrs. C. M. Villet and Son, Cape of Good Hope, advising the despatch per *Hastings* of the Society's annual consignment of vegetable seeds.

6. From R. Berkeley, Esq., Secretary A. and H. Society, Lahore, applying for any available surplus stock of vegetable seeds, from this Society's consignments. Forwarded.

7. From the Secretaries, Royal Asiatic Society and Society of Arts, returning thanks for copies of this Society's Journal, Vol. IX. Part 3.

(14th October, 1857.)

The Hon'ble Sir Arthur Buller, President, in the chair.

The proceedings of the last meeting were read and confirmed, and the gentlemen proposed on that occasion were elected members, viz. :—

Lieut. F. S. Stanton and C. A. Saubolle, Esq.

The following gentlemen were proposed as members :—

C. E. Chapman, Esq., Civil Service, Rajshaye ;—proposed by Mr. Henry Deverell, seconded by the Secretary.

J. D. Ward, Esq., Civil Service, Rajshaye ;—proposed by Mr. Deverell, seconded by the Secretary

H. W. Cooke, Esq., Sub-Deputy Opium Agent, Bhaugulpore ;—proposed by Mr. Thos. Grant, seconded by Mr. W. Landale.

Oscar Von Ernsthausen, Esq., Merchant, Calcutta ;—proposed by Mr. S. P. Griffiths, seconded by Mr. C. E. Cresswell.

John Wienholt, Esq., Merchant, Calcutta ;—proposed by Mr. Griffiths, seconded by Mr. Cresswell.

O. W. Malet, Esq., Civil Service, Beembhoom ;—proposed by the Secretary, seconded by Mr. W. G. Rose.

Adam Hume Smith, Esq., Indigo Planter, Jessore ;—proposed by Mr. S. H. Robinson, seconded by Mr. E. W. Wingrove.

The following contributions were announced :—

1. Several volumes of the Patent Office Reports of the United States, and some Reports of certain Agricultural Societies of the United States. *Presented by the Smithsonian Institution at Washington.*

2. Two Numbers of the Transactions of the Agricultural and Horticultural Society of Bombay for 1852, containing Reports on Teak and other plantations and forests, by Dr. Gibson, Superintendent Botanical Gardens of Western India. *Presented by Dr. Gibson.*

3. Specimens of black pepper, resin, gum-kino and gamboge from Arracan. *Presented by Capt. F. W. Ripley.*

Capt. Ripley states that the pepper is obtained from the jungles in the vicinity of the station of Sandoway; it grows most luxuriantly on the low hills, requires little or no care, and yields abundantly. The gum is the produce of a tree called "Pouk" by the Burmese: Capt. Ripley thinks it is the *Butea frondosa*. The resin is procured from a tree called "Kangyoung," which yields a kind of gurjun or wood oil.

4. An orchid (a species of *Dendrobium*) from Rangoon. *Presented by Mr. H. J. Butler.*

Nursery Garden.

The Gardener's monthly report was submitted, of which the following is an extract;—

"In continuation of my report for the month of September last, I beg to state that besides what I have said for the previous month, I have but little to add to that of the present month, as my time and attention have been principally occupied in laying down plots of ground in the kitchen garden for vegetables, and also making jute and other fibres. I have great pleasure in stating that the pea seeds sent to me on the 5th instant, viz. "Daniel O'Rourke" and "Early Emperor" have both germinated;—the former on the fourth day showed signs of germination of more than 60 seeds, and the latter about 20, and this day 85 of the former have germinated and of the latter above 40. In June last a few kinds of various seeds were presented by Captain Lowther of Assam, and these were put down in gunikas by my predecessor. As the result was not reported, I beg to send enclosed list showing such as have germinated and doing well. Captain Lowther had about the same time sent a few seeds of *Prunus Jenkinsii*, of these ten seeds have germinated: I intend to pot them off as soon as they grow a little more, to strengthen them, and afterwards lay a few of them in the ground in the orchard along the pine-apple plants, where I think they will suit best. Captain Lowther had also presented to the Society a packet of seeds supposed to be the *Passiflora edulis*, of these a quantity was put down, which I reported in August last, and I am happy to say that out of 100 seeds at the end of eighty days 80 seeds had freely germinated, which I consider to be very good, and shall report on them again when they are more in foliage. The *Daphne viridiflora* which I suppose was presented by Dr. Thomson, Superintendent of the Hon'ble Company's Botanical Garden, in July, 1856, having flowered in July last, I obtained three berries, which I had immediately put down, and the result I am happy to communicate is, that all three have germinated within the space of seventy days, though the seeds, I believe, take two years to vegetate in England. In March, 1850, a number of apple plants imported by Mr. Ludd, of the Ice-house, from North America, were purchased by the Society. One of these plants, known as *Pyrus malus*, or the Early Bough apple, has

for the first time this year yielded three fruit, and I am taking every care to bring it to perfection if possible."

Chemical Investigation of the Cotton Plant.

Read a letter from the Secretary to the Board of Revenue, L. P., requesting information, on behalf of the Professor of Chemistry of the University of Alabama, U. S. with a view to the chemical investigation of the cotton plant.

Letters were also submitted,

1st. From W. C. Brunton, Esq., Deputy-Superintendent of Electric Telegraphs in India, dated from Bombay, 26th September, reporting on the juice of *Euphorbia Cuttenundoo*, (a quantity of which was sent in January last, by the Hon'ble Walter Elliot, of Madras, to compete for the prize offered by the Society for a cheap and efficient substitute for gutta-percha,) and on the juice of *Euphorbia pentagonia* from Simla, forwarded by Capt. David Briggs. "I am satisfied"—observes Mr. Brunton—"the products in question are perfectly useless as substitutes for gutta-percha in its higher applications, and I am not aware of any purposes to which they could be applied with the advantage necessary to impart value to the substance."

2nd. From Colonel R. Strachey, Secretary to Government Central Provinces, applying for a supply of seeds sufficient to plant ground capable of giving fresh vegetables to one thousand soldiers every day for three months of cold weather.

The Secretary intimated that this application had been fully met from the Society's surplus stock.

3rd. From Messrs. Gibbs and Son, of London, advising the despatch per *Wellesley* of a consignment of Agricultural seeds, as ordered by the Society.

The Secretary announced the receipt of this fine supply, consisting of cereals and other field crops, such as carrots, turnips, cabbages, mangul-wurzel, beet, flax, grasses of sorts, including, clover, lucerne, and rye grass, &c., &c., all of which were ready for distribution to members and to the public in general.

4th. From Messrs. James Carter and Co., advising the despatch of the Society's usual annual supply of flower seeds; also a quantity of "Early Emperor" and "Daniel O'Rourke" peas, which yield crops in six weeks.

(11th November, 1857.)

Baboo Peary Chand Mittra, Vice-President, in the chair.

The proceedings of the last meeting were read and confirmed, and the gentlemen then proposed were elected members, viz :—

Messrs. C. E. Chapman, Civil Service; J. D. Ward, Civil Service; H. W. Cooke; O. Von Ernsthausen; John Wienholt; O. W. Malet, Civil Service; and A. H. Smith.

The following gentlemen were proposed as Members :—

T. H. Bennett, Esq., Calcutta ;—proposed by Mr. T. E. Carter, seconded by Mr. W. G. Rose.

H. L. Dampier, Esq., C. S., Tirhoot ;—proposed by the Secretary, seconded by Mr. S. H. Robinson.

H. M. Reed, Esq., Civil Service, Burdwan ;—proposed by the Rev. J. Long, seconded by Baboo Gobind Chunder Sen.

Moonshee Buzlall Rhoman of Sealdah ;—proposed by Baboo Peary Chand Mittra, seconded by Baboo Shib Chunder Deb.

R. N. Farquharson, Esq., Civil Service, Patna ;—proposed by the Secretary, seconded by Mr. C. A. Cantor.

Frederick Brine, Esq., Executive Officer, Department Public Works, Hidjeelee ;—proposed by Mr. E. DeCruz, seconded by Mr. S. F. Seymour.

The following contributions were announced.

1. Geological papers on Western India, with an Atlas of maps and plates. *Presented by the Government of Bengal.*

2. A few small mangosteen plants. *Presented by C. A. Cantor, Esq.*

3. A fine graft of a description of sweet lime. *Presented by R. F. Ross, Esq.*

4. A small quantity of California potatoes of a fine sort. *Presented by Captain White of the "Fiery Cross."*

5. A quantity of animal charcoal, through which cocoanut and rape oils have been passed, for experimental purposes in the garden. *Presented by C. B. Wood, Esq.*

6. A further sample of "Pwai-nyet," from Moulmein, and the little bees which produce it. *Presented by the Rev. C. S. Parish.*

7. Two samples of Tea from Tugvor (Darjeeling.) *Presented by the Rev. Dr. Boaz, on behalf of Captain J. Masson. Referred to the Tea Committee. Nursery Garden.*

The Officiating Gardener's monthly report was submitted. Mr. Manuel, after alluding to the work that had been done in the garden during the past month, refers to the trial sowings of the flower seeds received from Messrs. Carter and Co., and of seeds of cereals and other field crops from Messrs. Gibbs and Co. Of the 86 kinds of flower seeds, 26 have germinated very freely, 30 freely, 18 are germinating, 3 have germinated very partially, and 9 have, as yet, failed to vegetate. The field crop seeds to have not been sown sufficiently long to give a full report, which will be included in the next month's statement : up to the present time about half the number of sorts (85) have germinated freely.

Letters were read :—

1st. From the Rev. Dr. Boaz, regarding the samples of Tea from Darjeeling above alluded to, of which the following is an extract :—

"I send you two specimens of tea grown by Captain J. Masson of Darjeeling, at his tea plantation at Tugvor. Tugvor is a Northern spur of the Darjeeling

4. Two samples of cotton, Nos. 1 and 2, raised in different grants in the Soonderbunds, from Sea Island seed received from the Society, were placed on the table; together with a report on them from a member of the Committee in comparison with samples of original Sea Island, and with a most superior description of cotton raised at Melbourne from Sea Island seed. Mr. Freeland reports that "sample No. 1, is inferior to the Melbourne sample in length of staple, and its value is much depreciated by being so neaped. Sample No. 2, is fully equal to that from Melbourne, and would, in the Liverpool market, fetch about the same price; it contrasts very favorably with the original sample of Sea Island cotton, but is inferior in strength."

5. A supply of fine pods of *Vanilla planifolia*, the produce of the Society's Garden, gathered during the past month, was also placed on the table.

Nursery Garden.

The Officiating-Gardener's monthly report was read. Mr. Manuel states that the Penang fruit trees presented by Mr. Anthony, have reached in admirable order; that the ornamental bulbs received from Messrs. J. Carter and Co., have sprouted well; as also the California potatoes presented by Captain White, of the Steamer *Lightning*. Regarding the peas received this season, the Gardener reports that all the Cape kinds have germinated well, as also those received from Messrs. Carter of London; while those from America, have given an indifferent result, only one kind—the "black-eyed marrowfat" having succeeded well. Mr. Manuel adds that he has now ready for distribution a good collection of fruit grafts, such as mango, peach, lychee, orange, loquat, bail, rose-apple, lemon, avocado pear, &c. also vanilla plants; and in the floricultural department 50 plants of *Amherstia nobilis* for those members whose names have been registered.

A report from the Garden Committee was brought up, suggesting the expenditure of Rs. 150 for improving the flower garden walks and a disbursement for manure, which is much needed, and for certain articles, such as new wheelbarrows, water-cans, &c. Agreed to on the recommendation of the Council.

Report on certain products from Sandoway.

The following report was submitted from Dr. J. B. Barry, on the specimens of pepper, gamboge, rosin and gum received from Captain F. W. Ripley, Assistant-Commissioner of Arracan, and laid before the last general meeting:—

"The pepper is a fair specimen of the kind generally met with in the Calcutta market, but the berry does not possess that hardness and firm substance which characterizes the best Sumatra pepper.

"The gamboge is very inferior as regards color, but this must be due to the presence of foreign matter, as it possesses all the other properties peculiar to the species—no doubt the exposure to heat over the fire must have occasioned it. The Gum is not the kino of commerce—it is much less astringent, is not so rich in colour, and not grainy^o as the kino is; it is po

doubt, as you remark, the product of the *Butra frondosa*. The resin, you describe as coming from the tree called "Kang Young" resembles nothing that I have seen before, it is not soluble in spirits of wine, and but partially so in turpentine—the varnish, however, from this solution is remarkably clear, and tenacious, although deficient in body. Where a thin coat is wanted it would answer well. On burning it gives out a most aromatic and fragrant smell, similar to frankincense and might well be substituted for that gum, if cheaper."

Resolved, that the best thanks of the Society be given to Dr. Barry, for this report; that a copy be forwarded to Captain Ripley, and that he be requested to favor the Society with a larger sample of the resin, for further experiments.

Alleged injurious effects of artificial irrigation on the Cotton Plant.

Read the following communication, dated 4th December, 1857, from the Secretary Board of Revenue L. P. together with its enclosure, on the above subject:—

"The Board of Revenue having been instructed by the Government to obtain the opinions of persons acquainted with the cultivation of the cotton plant, in regard to the injurious effects of artificial irrigation alluded to in the accompanying extract from a letter from the Collector of Broach, direct me to solicit the aid of the Agricultural Society in procuring information on the subject.

Extract Paras. 1 to 4, of letter from the Collector of Broach, No. 346, dated 11th June, 1855.

"1. I have the honor to acknowledge the receipt of your endorsement, No. 120 under date the 19th January last, upon a letter to Government, from the Secretary to the Western India Canal and Irrigation Company, explanatory of the plans and views of that Association in respect to the extension of irrigation throughout this Presidency.

"2. The greater part of the land of this Collectorate being composed of a deep black soil, and rendered annually subservient to the cultivation of Cotton, for which it is peculiarly adapted, there will not, I apprehend, be found many facilities for the construction of canals within its limits, as irrigation supplied artificially, far from improving the growth and staple of the cotton crop, acts injuriously towards it, weakening the fibre, and reducing its value to a corresponding extent. The only land upon which I have ever seen cotton improved by a supply of water from artificial sources is in some parts of Sinde, but there the deep alluvial deposit differs widely from the heavy black soil of Guzerat, and there is no degree of assimilation between the two which would render the latter capable of the same treatment as the rich tracts skirting the banks of the Indus.

"3. It cannot, I imagine, be in contemplation to attempt the supercession of the cotton growth here by other crops, for though possibly these might to some extent be capable of producing a higher market value, they could never wholly, or even more than partially, take the place of the present staple of the Collectorate, and that I am assured can never here be improved by the

adventitious means adverted to : there is no doubt that in seasons of drought the security of the cotton crops would in some degree be maintained by the supply of water which would be poured over it from the canals, but the indifferent yield which would result from that mode of preservation, would seldom cover the increased amount of assessment which would be leviable.

"4. The Company, therefore, will not, I presume, initiate their proceedings by breaking ground in this Collectorate, for I have no doubt other portions of the Presidency will be found to provide a far more profitable field of speculation, and therefore one more worthy of their early efforts on its behalf; there is, however, one small tract of country lying between the Myhee and Duadur rivers, formed partly of red soils, which I am told, might be found well suited to the purpose in view, and which I shall bring more fully hereafter to the Company's notice when I have had an opportunity of personally surveying it."

Resolved, that the above communication be referred to the Cotton Committee; further, that it be published *in extenso*, in the proceedings of the Society, with the view of eliciting information on the subject.

Letters were likewise read :—

1. From Messrs. Mackinnon, Mackenzie and Co, Agents Calcutta and Burmah Steam Navigation Company, in reply to an application recently made to them, of which the following is an extract :—

"With reference to your letter of 16th instant, annexing copy of a letter from Captain Ripley, Sandoway, we beg to state that we comply with your request to carry specimens, plants and seeds, by the Steamers of the above Company to and from Arracan and Burmah freight free. It must, however, be borne in mind that the vessels employed in running between Calcutta and the Burmese ports are of small tonnage, and that only a limited space can be given for the above purpose. We shall inform the agents at the out-ports of this arrangement by first mail."

Resolved, that the best acknowledgments of the Society be conveyed to Messrs. Mackinnon, Mackenzie and Co., for their liberal compliance with the Society's request.

2. From Colonel F. Jenkins, applying for coffee seed, to meet the wants of some residents in Lower Assam. Colonel Jenkins also gives the following items of information respecting tea cultivation :—

"These [coffee seeds] are intended to be sown in some low hills where the gentlemen have now tea growing very well. We have every prospect of all the low ranges of hills near this being ere long covered with thriving plantations of tea; several are commenced on, and the plants get on well. The only pity is, we did not begin some years ago, but few then would believe that tea would thrive near this (Gowhatti.) I have not heard of the out-turn of all the private tea traders for this past season, but what I do know, and from what I have heard of last season's crops of others, I think the quantity of

private tea will be above 150,000lbs, and the Assam Company expected about 700,000lbs : so that we may state all the Assam tea of the season at 850,000lbs, and I shall be greatly disappointed if we do not exceed the million of pounds next year. But there has been considerable disappointment on many accounts this year, or the private trade (*i. e.* not Assam Company's) would have been considerably greater ; and a short crop of seed will materially lessen the extension of plantation."

3. From the Secretary Public Library, Bhaugulpore, applying for a set of the " Indian Agricultural Miscellany" in Bengali. Granted.

4. From Messrs. James Carter and Co. advising despatch of a collection of ornamental bulbs for the Society's garden.

R E P O R T

OF THE

Agricultural and Horticultural Society

OF INDIA.

*Report from the Council to the Annual General Meeting of the
15th January, 1858.*

THE Council have to make the following Report to the Members of the Society on the occasion of their present Annual Meeting.

They have to commence, as usual, with a summary of the state of the subscription list: and they are glad to announce that, notwithstanding the year which has just closed has been an unprecedentedly disastrous one in the history of British India, the number of Members elected—namely 72—do not fall below the average of the last eleven years, as will be seen by a glance at the following classification list:—

CLASSIFICATION.	In 25 former years.	In 1846.	In 1847.	In 1848.	In 1849.	In 1850.	In 1851.	In 1852.	In 1853.	In 1854.	In 1855.	In 1856.	In 1857.	Gross Total.	Total real number at close of 1857 after deducting lapses.
Honorary Members,	11	1	0	1	0	0	0	1	0	1	0	2	0	17	11
Associate Members,	2	0	0	0	0	1	1	0	0	0	0	0	0	4	2
Corresponding Members, ..	0	1	0	0	0	0	1	1	1	0	0	0	0	4	3
Civilians,	232	13	15	22	8	10	22	16	18	6	23	23	17	425	162
Merchants and Traders, ..	201	14	12	13	10	14	20	12	5	16	18	31	11	377	122
Indigo and other Tropical Agriculturists, ..	190	15	6	5	1	9	19	13	10	7	14	12	10	311	99
Military Officers, ..	169	10	11	11	11	9	34	18	22	19	26	22	12	365	134
Medical Officers, ..	86	0	2	3	5	7	4	5	3	4	6	9	3	131	30
Asiatics,	63	2	14	5	6	9	8	8	8	5	5	7	14	154	58
Clergy,	14	1	0	0	0	2	1	1	1	1	2	1	2	26	10
Law Officers, ..	40	1	0	0	6	4	6	3	1	3	6	2	1	73	23
Miscellaneous, ..	9	0	2	0	2	2	6	0	0	10	0	0	2	33	23
	1002	58	62	60	49	67	122	78	69	72	100	109	72	1920	677

In the lapses referred to in the last column, are comprised 48 deaths* 43 resignations, 4 whose names have been withdrawn, their subscriptions being irrecoverable, and 7 removed from the list in accordance with Section VI of Chapter III of the Bye-Laws, their absence from India having extended beyond four years ; making in all 102.

Of the above mentioned number (677), 33 are members who have compounded for their subscriptions, 108 are absent from India, and 16 are Honorary, Associate, and Corresponding—in all 157 ; leaving 520 as the actual number of paying members at the close of the year.

The number of members lost to the Society by death during the past 12 months is greater than in any previous year since the formation of the Society, arising from a contingency which it is to be fervently hoped, may never occur again. The general mutiny of the native army of Bengal has deprived the Society of no less than 29 members, including some of its oldest and most zealous correspondents.

* The Hon'ble H. R. Addington, (74th Regt. N. I.) ; His Excellency General the Hon'ble Geo. Anson, Commander-in-Chief ; Sir Robert Barlow, C. S. ; Messrs C. E. Boileau, C. S. ; H. Biddle ; Dr. H. H. Bowling ; Lieut. E. W. Barwell, (13th N. I.) ; Lieut.-Col. F. W. Birch, (41st N. I.) ; Lieut. F. W. Brodie, Malwa Contingent ; Capt. F. M. Burlton, Gwalior Contingent ; the Hon'ble J. R. Colvin, Lieut. Governor N. W. P. ; Major G. L. Cooper, Artillery ; Messrs. H. Christie and G. J. Christian, C. S. ; Lieut.-Col. C. G. Dixon, Supt. of Ajmere ; Messrs. Charles DeVerinne ; Joseph Finch ; F. Frost ; R. B. Garrett, C. S. ; E. Greenway ; Capt. H. J. Guise, (13th Irr. Cavalry) ; Brig. J. Handscomb (72nd N. I.) ; Major G. E. Hollings, (38th N. I.) ; Capt. Fletcher Hayes, (62nd N. I.) ; Major J. G. Holmes, (12th Irr. Cavalry) ; Messrs. R. H. Hewett ; R. Ince ; D. Jenkins ; Lt. Col. W. J. B. Knyvett (38th N. I.) ; Major F. Knyvett (64th N. I.) ; Brigadier-Genl. Sir Henry Lawrence, Commanding Troops in Oude ; Lieut. Monk-Mason, Political Agent at Joudpore : Messrs. C. J. Montague ; M. C. Ommaney, C. S. ; Thos. Palmer ; J. W. Payter ; R. E. Ronald ; Lieut.-Col. D. Ross, Commissioner of Leia ; Lieut.-Col. H. Spottiswoode (55th N. I.) ; Lieut. Geo. Snell (64th N. I.) ; Messrs. Gow M. Smith ; H. B. Thornhill, C. S. ; G. D. Turnbull, C. S. ; Lieut. E. Walker (Engineers) ; Major General Sir H. M. Wheeler, Commanding Cawnpore Division ; Lieut. G. R. Wheeler (1st N. I.) ; Captain F. Whiting (Engineers) ; and Mr. G. R. Wilby.

But, notwithstanding this unusually heavy list of casualties, it is satisfactory to the Council to be able to report favorably of the financial position of the Society, as a reference to the annexed statements will shew.

The total receipts during the year amount to Rs. 25,385-3-7, adding to which the balance in hand at the close of 1856, viz., Rs. 1212-14-3 shews the total of receipts as per statement, Rs. 26,598-1-10. The disbursements during the year amount to a total of Rs. 24,437-7-5, which deducted from the receipts, leaves the balance of cash in the Bank of Bengal, and with the Secretary, on 31st December, Rs. 2160-10-5. The vested fund remains the same namely Rs. 20,333-5-4. The liabilities of the Society amount to Rs. 7,235-0-0 and the dependencies, including the cash balance, to Rs. 11,884-8-11, after deducting the sum of Rs. 945-13, as assumed irrecoverable subscriptions from deceased members, and from others whose names have been removed from the list.

The usual exhibitions have been held during the year, the two first in January and March in the Auckland Garden, the third in April in the Town Hall. There is nothing calling for remark in connection with these shows, except that they were about equal in variety of produce submitted, and in quality to those of 1856. The amount distributed in prizes was Rs. 1111 and 8 bronze medals.

The Council are happy to state that the importation during the season of vegetable and flower seeds from North America, the Cape of Good Hope, and England, have given satisfaction; especially the flower seeds from England, which are, perhaps, superior to any yet received from Messrs. Carter and Co. A trial collection of seeds of field crops from Messrs. Gibbs and Co. of London, has not proved so satisfactory; several kinds, more particularly the cereals, having altogether failed. The disturbed state of the country has prevented so wide a distribution of these seeds as would otherwise have been the case.

In connection with this department, the Council are glad to announce that the Lieutenant-Governor of Bengal has been recently pleased to allow the Society to send and receive cases of plants from Assam by the Government Steamers, freight free; also the liberal

compliance by the Agents of the Calcutta and Burmah Steam Company for the free transmission of plants, seeds, and specimens, to and from Arracan and Burmah. These privileges will, it is hoped, ensure the receipt of larger supplies of plants and specimens from those parts, more especially from the Society's valued members and correspondents, Captain W. H. Lowther, of Deebroghur, Upper Assam, and Captain F. W. Ripley, of Arracan, to whom the Institution is already so much indebted.

The demand on the Nursery Garden for fruit grafts and other plants, though not quite equal to that of 1856, has exceeded all previous years. The statement submitted by the Officiating-Gardener, shews that nearly 11,000 useful and ornamental plants have been distributed, besides a quantity of seeds and a supply of bulbs and tubers of yams, sweet potatoes, arrow-root, &c. There is no doubt that the distribution would have exceeded that of last year, had not circumstances prevented the despatch of plants into the interior during the last rainy season. Notwithstanding this, the amount realized by the sale of fruit grafts (Rs. 837) is rather more than that of 1856; and there is still a large stock of these, as also of ornamental plants, on hand, steps having been taken, in the early part of the year, to propagate very largely, in anticipation of a greater demand than usual, in consequence of the non-distribution of plants, in future, from the Honourable Company's Botanic Garden. It is, perhaps, worthy of notice that there has been a greater call, during the past 12 months, for roses, than for any other description of ornamental plants; many plants of *Amherstia nobilis* have also been issued, and a fresh supply has recently been propagated for distribution at the commencement of next year. The stock of the beautiful green-striped China bamboo, presented by Mr. Arbuthnot Emerson, has likewise been increased, it being so desirable an addition to a general collection of plants. The demand for the China wax-insect tree (a species of *Fraxinus*) and for the plants (*Rhamnus chlorophorus* and *R. utilis* of *Decaisne*) from whence the Chinese derive the substance known as Chinese green; and for vanilla* plants of sorts,

* A hundred pods of *Vanilla planifolia* and *aromatica* of last season's gathering, have been sent for report to the Society of Arts of London.

has not been so great as was anticipated ; and consequently these having been largely propagated, more especially the two latter, the stock on hand is considerable. A small stock has also been raised from the Hemp palm, *Thuja* species, and *Salisburia adiantifolia*, forwarded from China by Mr. Fortune in 1854-55 ; and likewise of the Cocoa-plum (*Chrysobalanus Icaco*), the root, bark and leaves of which are prescribed in Brazil against diarrhoea and similar maladies. To Dr. Thomson, the Superintendent of the Hon'ble Company's Botanic Garden, Calcutta, the Society is indebted for a large supply of plants, which has proved a very desirable addition to its general stock for distribution, and to Dr. Gibson, Superintendent of Botanic Gardens of Bombay, for a collection of olive grafts.

In the economical garden, attention has been directed, as usual, to the culture of sugar-canec of different kinds, fibre-yielding plants, arrow-root, tapioca, Guinea grass, West Indian ginger, and yams of various sorts, such as the Chinese potato (*Dioscorea Batatas*), the yam-yielding aerial tubers from the Eastern Archipelago, and those from Rangoon, the Tenasserim Provinces, and Chota-Nagpore. About three beegahs of ground are also under cultivation with various kinds of foreign cotton, from imported and acclimated seed ; and particulars of the result will be given in the next report. The propagation of coffee has been extended, and an unusually large number of plants distributed during the past season. An addition has likewise been made to the stock of Carob plants (*Ceratonia siliqua*.) From the vegetable garden large supplies of peas and Indian corn have been raised for general distribution.

In connection with this department, the Council desire to offer a few remarks respecting the Garden School. It was mentioned in the last report that the then state of the School was by no means satisfactory, and the subject was under the consideration of a Sub-Committee of the Council. The Sub-Committee submitted the result of their suggestions in a long report to the March meeting. They mentioned, that though the school had been in existence for nine years, and many boys had entered it, only two, so far as could be traced, had followed the profession of gardening, though every encouragement had all along been held out to them to remain at their posts, till such time as they were old enough to accept

situations as gardeners in the country or in Calcutta, upon higher wages than are given to uneducated men of that class. The Committee were of opinion that, notwithstanding this failure, efforts should be continued, on the ground that it is impossible any permanent improvement can take place in horticulture without an intelligent and trained body of *malis* to carry them out. They, therefore, offered the following suggestion :

“That the Society apply to the magistrates of certain districts of Bengal, say Twenty-four Pergunnahs, Hooghly, Kishnagur, Berhampore, Bhagulpore, Patna, Jessore, Tirhoot, Dacca, Rungpore, Dinagepore, and Rajshahye, to send down a *mali* from each district, or 12 in all as a beginning, men not beyond 30 years of age, to learn practical gardening in the Society’s Garden, the Society, giving them mere elementary education in Bengali for a period of one or two years, and agreeing to allow each man Rs. 6 per mensem, exclusive of travelling expenses, from the period of engagement, till the completion of the proposed period. After which time a certificate of proficiency, if entitled to it, to be granted to them, to enable them to obtain situations elsewhere of Rs. 10 a month ; and further, guaranteeing them that amount till they obtain such situations : it being distinctly understood that a *mali* declining to accept a situation, will not be entitled to receive any further stipend from the Society, and in the event of a *mali* not obtaining a certificate of proficiency within two years, the Society’s engagement with him will cease.”

This report was adopted by the meeting, and no time was lost in acting on it. The Council, however, regret to state that it has only been responded to in one instance, that of Mr. Molony, the magistrate of Jessore, who failing to obtain any candidates elsewhere, sent his own Gardener, who is at present working in the Society’s Garden. It is probable that the disturbed state of the country, has, in some measure, caused this absence of co-operation, and the Council would suggest that the subject be again mooted at no distant date, or so soon as tranquillity is fully restored. It is, however, gratifying to them to add, that a member of the Society, Baboo Puddumlochun Mundul, Zemindar of Balasore, has sent two young men at his own expense to be trained as Gardeners, and they have given every satisfaction, as steady industrious men, willing to improve

themselves in their business. The Council would wish it were in their power to add that a few only of the many wealthy Zemindars of Bengal, had followed the good example of Baboo Puddunlochan Mundul.

The Council cannot close this portion of their report without expressing their regret at the loss the Society has sustained in the departure of their Head-Gardener. Mr. McMurray left the Society's employ in July last, after seven years useful, zealous and faithful labors, having obtained a more lucrative employment in one of the Cachar Tea Companies. The Council having failed to secure the services of a competent gardener in this country, propose taking immediate steps to obtain one from England. In the mean time the Council have appointed Mr. J. Manuel, who was the Officiating-Gardener during Mr. McMurray's leave of absence in 1855.

Allusion was made in the last Report to the fact of several bales of the straw of certain Indian grasses having been forwarded to the Society of Arts with the view of ascertaining whether any of them contain the necessary ingredients for paper manufacturing, superior to the common rush of England. The report of competent judges is unfavorable. They consider that none of them are well adapted for the making of paper, though they do not doubt that paper can be made from all of them. The common rice straw (*Oriza sativa*) would make the best. They add that all the samples are very inferior in paper-making quality to many substances which can be obtained readily in England, but which even are not considered as worth using; in fact it would appear that materials well fitted for making paper, can be brought and delivered at the paper mills for less money than the mere freight from this country of any of the specimens sent by the Society. The remarks of Mr. Foster on this subject, are so much to the point, that it is considered desirable to reintroduce them here for the information of interested parties:—"There is much misapprehension abroad as to the want of paper-making materials here. For first-class papers and for inferior papers there is no want of materials at all, but for medium papers, for printing purposes, there is *some* scarcity of materials, as evinced by the somewhat higher proportionate price given, as compared

with the price of materials for other classes. New materials involve new machinery for reducing them to pulp, and the older paper makers have not yet established machinery suited for these new materials in addition to that at present in use. Some enterprising men are beginning to take the matter up, and are laying themselves out to make pulp or half stuff for sale to the paper-makers, and it will be by those men that any new material will be worked. It is to them that I have shown your materials. The regular paper makers would scarcely look at them."

Another article to which reference was made on a previous occasion, is the drug "Atees," obtained from the tubers of *Aconitum heterophyllum*, a native of the Himalayas. It was stated that the very favorable reports furnished by the late Mr. Sub-Assistant Surgeon Hemming of Oorai, on the valuable properties of this drug, as being, perhaps, the best known substitute for Quinine, had induced the Society to submit them to the notice of the proper authorities. Dr. Mouat, Superintendent of Jails, Lower Provinces, has stated to the Society that, attracted by the nature of these reports, he had sent for a quantity of the powder, with the view of having a full and fair trial given to it. The Medical Board have also promised to furnish the Society with any additional facts of importance regarding the medicinal action of this drug, which the reports of certain Medical Officers, to whom it has been furnished, may convey.

Another part of the Society's Journal, completing the Ninth Volume, has been published during the year, containing notices on silk, flax, cotton, sugar-cane, China green dye, &c.; also interesting papers on the Province of Cachar, its inhabitants, and its products; on the discovery of the tea plant in Sylhet, and a series of experiments for improving the present silk-worm yielding species of Bengal. The first part of Vol. X. is now in the press, and will be published in the early part of 1858.

The Council have to report that specimens have been submitted to compete for prizes for best substitutes for Box-wood and Gutta-percha, but there has been no competition for the prizes detailed in

lxx *Report of the Agri-Horticultural Society of India.*

the last report as having been offered for substitutes for hemp and flax, for rhea fibre, for best samples of cotton raised from exotic and indigenous seed, &c; or for best practical essays on certain products. The time for which these prizes were open having now expired, it will be for the Society to decide whether they shall be renewed either wholly or partially.

The Society has also accorded due attention to other subjects that have come before them during the past twelve months, in connection with samples of various products, such as fibres of kinds from certain parts of India, raw silk and other products from Arracan, oils from Gorruckpore and Benares, substitutes for Gutta-percha from the Madras Presidency and Simla, a curious description of bees-wax from Moulmein, &c.; all which having been duly referred to in the proceedings, the Council consider it unnecessary to allude more in detail in this place. They cannot, however, close this brief summary, without expressing their regret that the operations of 1857 should have been so meagre. The Society, as before remarked, has suffered, in common with all Indian Institutions, from the very disastrous events of the past year, and not the least in the cessation of extensive correspondence with residents of the Punjaub, the North-Western Provinces, and some portions of Bengal, whereby the discussion of several subjects of interest, has, in some instances been delayed, and in others, it is to be feared, altogether lost. They can only hope that the return of tranquillity, may bring not only a *renewal*, but an *increase* of interest in the manifold objects for the consideration and advancement of which the Society has been instituted.

Statement of Receipts and Disbursements of the Agricultural and Horticultural Society of India, from 1st January to 31st December, 1857.

RECEIPTS.

From Members, Subscriptions collected during the year, ...	Co.'s Rs.	15,686	7	0
„ Government Annual Donation,	5,000	0	0	
„ Ditto monthly allowance for December, 1856, ..	135	13	6	
„ The Right Honorable Lord Canning, annual donation, for the year 1857,	500	0	0	
		5,635	13	6
„ Accruings of interest on fixed assets,		613	5	4
„ Proceeds of sugar-cane delivered from the Nursery Garden,	15	0	0	
„ Ditto, of fruit-tree grafts delivered from the Nursery Garden,	822	14	0	
„ Ditto, of a portion of surplus Cape, and American vegetable, English and French flower seeds of 1856-57, ..	1,478	13	0	
„ Ditto, of English vegetable seeds,	100	0	0	
„ Ditto, of Bulbs,	2	11	0	
„ Ditto, of copies of <i>Transactions</i> of the Society, ...	27	0	0	
„ Ditto, of copies of <i>Journal</i> of the Society,	124	0	0	
„ Ditto, of copies of <i>Indian Agricultural Miscellany</i> , ...	36	12	6	
„ Ditto, of sale of old seed boxes, casks, &c.	27	12	6	
„ Members, amount repaid for postages, pots, and packing charges for seeds, &c.,	446	1	6	
„ Ditto, for glazed cases, &c.,	93	14	0	
„ Ditto, amount repaid for freight on boxes of seeds forwarded in 1856 57,	51	0	9	
„ Visitor, cost of repairing an iron chair broken by him, ..	10	0	0	
„ Mr. McMurray, balance of Christian boys & Provider's wages for October, 1856, not applied for,	13	9	9	
		3,249	9	0
Total Receipts, Co.'s Rs.,				
		25,365	3	7
By Balance in the Bank of Bengal on 31st December, 1856, ...	1,151	14	6	
„ ditto in the hands of the Secretary on ditto,	60	15	9	
		1,212	14	3
Grand Total, Co.'s Rs.,				

DISBURSEMENTS.

FOREIGN, VEGETABLE AND FLOWER SEEDS.

By Messrs C. M. Villet & Son for Cape garden seeds supplied in 1857,	1,788	0	0
„ Messrs. D. Landreth and Co. for American garden seeds, &c., supplied in 1856,	1,959	3	0
„ Messrs. James Carter and Co. in full of their bill, amounting to £254-19-6 for English flower seeds, supplied in 1856, ...	2,411	9	3
„ Messrs. Rollison and Son for flower seeds supplied in 1856,	58	12	3
„ Additional packets of American and English vegetable seeds,	100	0	0
	<hr/> 6,317 8 6		

ATEES' POWDER.

By Mr. Henning for a quantity of Atees' powder,	12	0	0
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LIBRARY.

„ Books purchased during the year for the Library,	333	2	9
„ Binding books during the year,	29	8	0
	<hr/> 362 10 9		

PRINTING.

„ Sundry parties for printing receipts and schedule of prizes for flower shows, &c., &c.,	49	8	0
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JOURNAL.

„ Bishop's College Press, for printing Part 3 of Volume 9,	1,076	2	6
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NURSERY GARDEN.

„ Ordinary expences incurred on account of the Nursery Garden from 1st December, 1856, to 30th November, 1857,	3,986	4	0
„ Extra ditto, for purchase of fruit seedlings for grafting, for glazed cases, pots, for widening and repairing roads, and for sundry other contingent expences,	1,328	8	6
„ Messrs. G. F. Lackersteen and Co. for a roller, harrow and bullock cart, and repairing an iron chair,	332	0	0
„ Dr. Gibson for cost of glazed cases, &c., for olive grafts, ...	43	0	0
„ Duty and landing charges for 2 packages of iron wire fence, ...	10	12	0
	<hr/> 5,700 8 6		

ESTABLISHMENT.

Amount for establishment from 1st December, 1856, to 30th November, 1857,	7,437	2	0
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PECUNIARY REWARDS.

„ Prizes to Mallees for vegetables and fruits at the exhibition held on the 28th January, 5th March, and 1st April, 1857,	845	0	0
„ Ditto to ditto, for flowers at ditto, on the 28th January, 5th March, and 1st April, 1857,	266	0	0
	<hr/> 1,111 0 0		

ADVERTISEMENTS.

„ Advertising in the Calcutta and up-country Newspapers notices of general meetings, of shows of vegetables and flowers, distribution of seeds, offer of premia, &c., &c.,	365	3	0
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Carried over, Co., Rs. . . 22,431 11 3

Statement.

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STATIONERY.

	Brought forward, ..	22,431	11	3
By Stationery for office books, &c., and for the use of the office, ..		77	0	0
„ Brown packing paper for packing seeds,		129	0	0

FREIGHT.

„ Freight on boxes of seeds, books, &c., sent and received from the Cape of Good Hope, and America, &c.,		285	0	3
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METCALFE HALL.

„ Society's proportion of assessment on Metcalfe Hall from November, 1856, to September, 1857,	140	0	0
„ Ditto of ditto for lighting from January to September, 1857, ..	31	8	0
„ Messrs. Ford and Self for 12 yards carpeting	12	0	0
„ Messrs. Jessop and Co. for repairing half of the iron gate of the north entrance,	15	0	0
„ Modosuden Roy for Society's proportion for inspecting and looking over the Metcalfe Hall Building from April, 1855, to March, 1857,	40	0	0

INDIAN AGRICULTURAL MISCELLANY.

„ Rev. W. O'Brien Smith for printing 550 copies of Indian Agricultural Miscellany Part 6 Vol. 1,	166	4	0
„ Ditto for reprinting 550 copies each of ditto, Part 2 and 3, Vol. 1,	80	0	0
„ Mooktaram Surmono for translating certain papers for ditto, Part 6 Vol. 1,	50	0	0
			296 4 0

GRINDLAY AND CO.

„ Messrs. Grindlay and Co. for a set of Bills for £20 on account, ..	191	0	9
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PETTY CHARGES.

„ Sundry charges, including postage on letters, &c., sent and received, copies of the Journal,	503	7	9
„ Extra packermen for subdividing seeds,	27	1	0
„ Soldering tin boxes and lining with wooden boxes with tin,	10	9	3
„ Expences incurred in putting up a fence round a portion of the Auckland Circus, &c.; for superintending the erection of tents for flower and vegetable shows for the season,	183	14	0
„ Messrs. Grindlay and Co. being balance due to them as per account dated 21st November, 1856,	9	14	9
„ Presents to constables for attending at Horticultural and Floricultural Exhibitions during the year,	48	0	0
„ Bank of Bengal for renewing notes and for fees and commission,	6	0	5
	788	15	2

Total Disbursements, Co.'s Rs. 24,437 7 5

By Balance in the Bank of Bengal on 31st December, 1857,	...	2,145	7	5
.. Ditto in the hands of the Secretary on ditto,	... ..	15	3	0
		<hr/>		2,160 10 5

Grand Total, Co.'s Rs. 26,598 1 10

MEMORANDUM.

DISBURSEMENTS.

The Amount of Disbursements during the year 1857,	
as per Statement, ...	24,437 7 5
.. Balance in the Bank of Bengal on 31st December, 1857, ...	2,145 7 5
.. Ditto in the hands of Secretary on ditto, ...	15 3 0
	<u>2,169 10 5</u>
Total, Co.'s Rupees,	26,598 1 10

RECEIPTS.

By Amount of Receipts during the year 1857, as	
per Statement, ...	25,385 3 7
.. Balance in the Bank of Bengal on 31st December, 1856, ...	1,151 14 6
.. Ditto in the hands of Secretary on ditto, ...	60 15 9
	<u>1,212 14 3</u>
Total, Co.'s Rupees,	26,598 1 10

DEPENDENCIES.

Amount invested in Government Securities lodged	
in the Bank of Bengal, ..	20,333 5 4
Ditto of Subscription in arrear, ...	7,994 2 0
Ditto of outstandings for seeds, grafts, copies of Journal, &c., &c., against various members, ..	686 12 6
Ditto of outstanding for seeds against A. & H. Society Punjab, ..	1,043 0 0
	<u>1,729 12 6</u>
	9,723 14 6

LIABILITIES.

Amount due by the Society for American seeds of 1857, ..	
..	3,032 0 0
Ditto for Agricultural seeds from England, ..	1,075 0 0
Ditto for English flower seeds, bulbs, &c., ..	2,957 0 0
Ditto for English vegetable seeds, ..	110 0 0
	<u>7,234 0 0</u>

LIST OF MEMBERS
OF THE
Agricultural & Horticultural Society

I N D I A.

DECEMBER 31st, 1857.

ALPHABETICALLY ARRANGED

AND

DISTINGUISHING THE YEAR OF ADMISSION.

OFFICE-BEARERS.

President :

THE HON'BLE SIR ARTHUR BULLER.

Vice-Presidents :

A. GROTE, ESQ.	DR. THOMAS THOMSON.
RAJAH PERTAUP CHUNDER SING, BAHADOOR.	BABOO PEARY CHAND MITTRA.

Secretary and Treasurer :

A. H. BLECHYNDEN, ESQ.

Members of Council :

C. A. CANTOR, ESQ.
BABOO SHIB CHUNDER DEB.
J. CHURCH, ESQ.
BABOO GOBIND CHUNDER SEN.
J. AGABEG, ESQ.
S. P. GRIFFITHS, ESQ.
W. G. ROSE, ESQ.
BABOO RAMGOPAL GHOSE.
REV. JAMES LONG.
S. H. ROBINSON, ESQ.
GEORGE MAY, ESQ.
C. B. WOOD, ESQ.

Patron :

THE RIGHT HONORABLE CHARLES JOHN, VISCOUNT CANNING,

GOVERNOR GENERAL OF INDIA, ETC., ETC. ETC.

List of Members.

This Mark denotes Members who have compounded for their Annual Subscriptions.

† This Mark denotes Members who are absent from India, and therefore Non-contributors.

‡ This Mark denotes Members who, though absent, are desirous of continuing their Subscriptions.

HONORARY MEMBERS.

The Right Honorable Sir Edward Ryan, A. M., F.A.S., London,	1828
Charles Huffnagle, Esq., M. D.,	1837
John Forbes Royle, Esq., M.D., F.R.S., FL.S., F.G.S., Professor of Materia Medica, King's College, London, ..	1841
Colonel John Colvin, C.B., London,	1830
J. Mackay, Esq.,	
Don Ramon de la Sagra, Island of Cuba,	
Dr. Justus Liebig, Professor of Chemistry in the University of Giessen,	1843
James Hume, Esq. Magistrate, Calcutta,	1839
Lt.-Col. Francis Jenkins, Commissioner of Assam, ..	1828
The Right Honorable Sir Lawrence Peel, London, ..	1842
R. Fortune, Esq.,	1856

CORRESPONDING MEMBERS.

D. J. Macgowan, Esq., M.D., Ningpo,	1851
Dr. J. V. Thompson, Sydney,	1840
Dr. R. Riddell, London,	1853

ASSOCIATE MEMBERS.

Mr. Robert Scott, Head-Gardener, H. C. Botanic Garden, Calcutta,	1851
Capt. E. P. Nisbet, London,	1843

ORDINARY MEMBERS.

Admitted.

ABDOOL Guffar Khazee, Zemindar, Dacca,	1854
Abercrombie, † Major Wm., (Beng. Engineers,)	1837
Ackland, C. J., Esq. Calcutta,	1855
Ackland, † George, Esq., Merchant,	1853
Aga Syud Hossein Shoostree, Merchant, Calcutta, ..	1857
Agabeg, J. Esq., Merchant, Calcutta,	1854
Ainslie, W. Esq., Civil service, Bhaugulpore,	1847
Alexander, Henry, Esq., Civil service, Calcutta,	1846
Alexander, H. A. R., Esq., Civil service, Backergunge, ..	1855
Alexander, Robert, Esq., Civil service, Comr. of Rohilkund, Bareilly,	1856
Allardice, Geo., Esq., Calcutta,	1854
Allen, J. H., Esq., Merchant, Calcutta,	1850
Allen, W. J., Esq., Civil service, Calcutta,	1850
Alloowallea, * Rajah of Kapoorthullea, Jullunder, ..	1853
Anderson, P., Esq., Merchant, Calcutta,	1854
Anderson, † Major W., C. B. (Artillery,)	1847
Andrew, David, Esq., Indigo planter, Aurungabad, ..	1851
Armstrong, † Major G. C.,	1849
Atherton, H., Esq. Civil service, Chuprah,	1845
Aubrey, John H., Esq., Calcutta,	1856
Auld, S. J., Esq., Indigo planter, Surdah,	1846
BALFOUR, † G. G. Esq., Civil service,	1844
Balfour, † Lewis, Esq., Merchant,	1842
Barry, Dr. J. R., Medical Practitioner, Calcutta,	1856
Barry, G. R., Esq. Serajgunge,	1849
Barry, Thomas H., Esq., Merchant, Calcutta,	1856
Barstow, Colonel John, (58th N. I.,) Comg. at Jhelum, ..	1853
Barton, George, Esq. Merchant, Calcutta,	1838
Battersby, Arthur, Esq., Indigo planter, Bahukansi, Joynagore, ..	1855
Baugh, Capt. F. W., (26th N. I.,) Superintendent Keddah establishment, Kemaoon,	1855
Bax, J. H. Esq., Civil service, Ghazeepore,	1855
Bayley, H. V., Esq., Civil service, Calcutta,	1856
Beadon, C., Esq. Civil service, Calcutta,	1855
Bean, J., Esq., Sub-Deputy Opium Agent, Monghyr, ..	1850
Beaufort, Francis L., Esq., Civil service, Calcutta, ..	1838
Becher, William, Esq., Gowhatti,	1855
Becher, Col. A. M., Quarter Master General of the Army, ..	1856
Beddy, H. W., Esq., Junr. Asst.-Commissioner of Arracan, Ramree,	1855
Begbie, C. N. W., Esq., Merchant, Moulmein,	1854
Begg, Dr. D., Calcutta,	1850
Bell, † J. D., Esq., Barrister-at-law,	1855
Bennett, T. B., Esq., Indigo planter, Purneah,	1854
Bennett, T. H. Esq., Merchant, Calcutta,	1857

Bentall,* † Edward, Esq., Civil Service,	1837
Berkeley, L., Esq. Officiating Sudder Ameen, Delhi, ..	1855
Berkeley, R. Esq. Asst.-Commissioner, Lahore,	1857
Berrill, W. Esq., Allahabad,	1857
Bindabun Chunder Mittra, Baboo, Calcutta,	1853
Birch, Lieut.-Colonel R. J. H., C. B., Secretary to Govern- ment, Military Department, Calcutta,	1841
Bishop,* Lt. H. P., (Artillery,) Umballa,	1853
Bissumbhur Sing, Baboo, Zemindar, Beerbhoom,	1857
Bivar, Lieut. H. S., (18th Regiment N. I.), Principal Assistant Commissioner, North Cachar,	1854
Blacker, G. M. Esq., Merchant, Calcutta,	1850
Blagrave, † Capt. T. C., (26th Regt. N. I.)	1850
Blechynden, R., Esq. Merchant, Calcutta,	1854
Blechynden, A. H., Esq., Secy. Agri-Horticultural Socy. of India, Calcutta,	1851
Blundell, Honorable E. A., Civil service, Penang, ..	1848
Blundell, † Wm., Esq., Merchant,	1850
Blyth, Philip, Esq., Merchant, Calcutta,	1857
Boaz, Rev. Dr. T., Calcutta,	1850
•Bogle, † Lt. Colonel Sir Archibald, K. C. B.,	1830
Bourne Walter, Esq., Resident Engineer, E. I. Railway, Monghyr,	1850
Bowers, J. F., Esq. Bamundee Factory, Kishnaghur, ..	1850
Bowring, † Samuel, Esq., Civil service,	1840
Bracken, † William, Esq., Civil service,	1830
Bradbury, S. W., Esq., Kishnaghur,	1850
Brac, T., Esq. Indigo planter, Hatherria, Jessore, ..	1850
Brandis, Dr., Supt. of Forests, Rangoon,	1850
Bridgman, † J. H., Esq., Indigo planter,	1850
Brine, Frederick, Esq. Darjeeling,	1850
Bristow, † Capt. J. W., (19th N. I.)	1850
Brodie,* † Major T., (5th Regiment N. I.,)	1830
Brooke, Captain John C., (63rd N. I.) Commandant Meywar Bheel Corps, and Assistant Political Agent in Meywar, Neemuch,	1840
Brown, Forbes Scott, Esq. Merchant, Penang,	1840
Brown, Lt.-Col. W. G., (H. M. 24th Regt.,) Umritsur, ..	1850
Brown, Capt. D., 1st Madras Fusiliers, Asst.-Commis- sioner Bassein, Burmah,	1850
Brown, George, Esq., Merchant, Calcutta,	1850
Buller,* † Frederick Pole, Esq., Civil service,	1830
Buller, Sir Arthur, Puisne Judge, Supreme Court, Calcutta, (President,)	1840
Burbank, Capt. Charles, Comg. H. C. Steamer Fire Queen, ..	1850
Burkinyoung, † J. A., Esq. Solicitor, Supreme Court, ..	1840
•Burnett, † Major F. C., (Bengal Artillery,)	1830

Burton, John St. Edmund., Esq., Calcutta,	1850
Butler Wells, Esq., Civil service, Gya,	1857
Buzlall Rhoman, Moonshee, Zemindar, Sealdah,	1857
Byng, Hon'ble Capt. R., (62nd Regt. N. I.) Cherra Poonjee,	1852
 CALCUTTA, The Right Rev. the Lord Bishop of,	1850
Cameron, J. T. D., Esq., Head Master, La Martinière, Cal.,	1853
Campbell, W. F., Esq., Tipperah,	1838
Campbell,* Archibald, Esq., M. D., Medical service, Superintendent of Darjeeling;	1838
Campbell, T. A., Esq., Rajharra, via Shergotty,	1851
Campbell, Capt. A. M., (16th M. N. I.) Burmah,	1855
Campbell, Capt. Ivie, Dy.-Commr., North Berar, Booldana,	1854
Campbell, Lieut. Henri, (63rd Regt. N. I.) Berhampore,	1856
Canning, The Right Hon'ble, Charles John, Viscount,	1856
Cantor, C. A., Esq. Merchant, Calcutta,	1851
Carberry, R. J., Esq., Calcutta,	1853
Carew,† R. R., Esq.,	1846
Carnegy, P., Esq. Asst.-Commissioner, Pertabghur, Oude,	1857
Carshore, Rev. J. J., D. D., Chaplain, Murree,	1846
Carter,† J. W., Esq. Merchant,	1843
Carter, T. E., Esq.; Calcutta,	1852
Caspersz, H., Esq., Beerbhoom,	1854
Cautley,† Lieut.-Colonel Sir P. T., (Bengal Artillery,)	1833
Cave, Charles, A., Esq., Indigo planter, Konah factory, Purnea,	1857
Cave, H. S., Esq., Indigo planter, Purneah,	1852
Cavenagh, Lieut.-Colonel O., (32nd N. I.) Town and Fort Major, Calcutta,	1848
Champneys, Major E. G., (33rd N. I.) Deputy-Military- Auditor-General, Calcutta,	1848
Chapman, C. E., Esq., Civil service, Rajshaye,	1857
Chariol, J. A., Esq., Merchant, Calcutta,	1857
Cheap, Brigr.-Genl. Sir John, K. C. B.,	1841
Cheek, Alfred H., Esq., Civil Surgeon, Benares,	1855
Chesney, Lieut. G. T., Engineers, Roorkee,	1855
Chunder Coomar Chatterjee, Baboo, Merchant, Calcutta,	1856
Church, James, Esq., Merchant, Calcutta,	1850
Church, James, Esq., Junior, Merchant, Calcutta,	1851
Clark, A. N., Esq., Calcutta,	1856
Clark, Dr. Stewart, Offg.-Post-Master-Genl., N. W. P., Agra,	1855
Clarke, H. R., Esq., Civil service, Pooree,	1856
Clarke,† John, Esq.,	1855
Clarke, G. R., Esq., Indigo planter, Roodeipoor via Bongong,	1855
Clarke, Longueville, Esq., F. R. S., Barrister, Supreme Court, Calcutta,	1830

Clemen, Edward, Esq., Tobacco planter, Sandoway, ..	1855
Clerk, Dr. D. G., Dentist, Calcutta,	1856
Cockburn, G. F., Esq. Civil service, Cuttack,	1856
Cockburn, Wm., Esq. Raneegunge,	1846
Cockerell, H. E., Esq. Civil service, Banda,	1856
Colebroke,† Capt. T. E.,	1850
Collins, Dr. J. C., Civil Surgeon, Darjeeling,	1856
Colville,* Sir J. W., Chief Justice, Supreme Court, Calcutta, ..	1849
Colvin, B. J., Esq., Civil service, Calcutta,	1842
Comber, Lieut. A. R., (Adj. Assam L. I.) Deebroghur, ..	1854
Congreve, Lieut-Col. G., C. B., (H. M. 29th Regt.) Qr. Mr. General Queen's Troops,	1848
Cooke, H. W., Esq., Sub-Deputy Opium Agent, Bhaugulpore, ..	1857
Cope, Henry, Esq., Hurreekkee, via Umritsur,	1847
Cosserat, P., Esq., Lall Seriah Mootehary,	1857
Cossinath Chowdry, Baboo, Cossipore,	1849
Courjon, F., Esq., Indigo planter, Chandernagore,	1839
Court, M. H., Esq., Civil service, Allahabad,	1852
Cowell, James, Esq., Merchant, Calcutta,	1838
Cowie,* Henry, Esq., Merchant,	1837
Cox, Major-General H. C. M., (58th Regt. N. I.) Mussooree, ..	1838
Cox,† J. H. W., Esq. Indigo planter,	1845
Craster, Lieut. G. A., Engineers, Dinagepore,	1855
Crawford, J. A., Esq., Civil Service, Hooghly,	1857
Creswell, C. E., Esq., Calcutta,	1855
Crommellin, Lieut., Col. J. A., Darjeeling,	1857
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I N D E X

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LIST OF PREMIA FOR 1858.

The Agricultural and Horticultural Society beg to notify that they are prepared to award premia for the following articles, and for essays on certain subjects, to be submitted on or before the 31st December, 1858, subject to the conditions herein after detailed :—

PREMIA FOR CERTAIN ARTICLES OF RAW PRODUCE, &c.

FIBRES (SUBSTITUTE FOR FLAX).

For the production of any new vegetable fibre, which can be successfully applied to all the purposes for which flax is now used, and of which not less than 10 maunds to become the property of the Society.—Rs. 1,000, and Gold Medal.

FIBRES (SUBSTITUTE FOR HEMP).

For the production of a quantity of any vegetable fibre, which can be successfully applied to the purposes for which *hemp* is now used, and equally strong and durable, and of which not less than 10 maunds to become the property of the Society.—Rs. 500, and Gold Medal.

FIBRES (RHEEA).

For the production of at least 25 maunds of Rhea fibre, the whole to be the produce of the party tendering it, and which 5 maunds to become the property of the Society, to be accompanied by a detailed statement of the process followed in its cultivation and after preparation, and the cost of the same. The quality to be approved by the Society, and the fibre to be in a fit condition for the English market.—Rs. 1,000, and Gold Medal.

N. B.—In the event of there being more than one competitor, the premium to be adjudged to the best specimen.

COTTON (EXOTIC) LONG STAPLE VARIETY.

For the production of at least 10 maunds of good merchantable cotton, raised from foreign seed of the black-seeded long staple kind.—Rs. 1,000, and Gold Medal.

COTTON (INDIGENOUS).

For the production of at least 5 maunds of cotton raised from indigenous seed, of a quality superior to that now exported, and such as is likely to prove a substitute for the Upland Georgia or New Orleans cotton of the United States of America.—Rs. 500, and Gold Medal.

•N. B.—The producer or producers of the above cotton must submit to the Society a statement of the mode of cultivation, and cost of the same.

SUBSTITUTE FOR GUTTA PERCHA.

For the discovery and production to the Society of any new substance, the produce of India, which can be successfully used as a substitute for Gutta Percha.—Rs. 500, and Gold Medal.

MATERIALS, FOR PAPER-MAKING.

To the producer of at least 6 maunds of fibre suitable for manufacturing into fine paper, such as will prove an efficient and economical substitute for rags or other materials at present employed in India for that purpose.—Rs. 500, and Gold Medal.

QUININE-YIELDING PLANTS.

To the introducer of twenty healthy plants of South American Cinchonas, of the kind or kinds known to yield the best description of bark.—The Gold Medal.

MADDER.

For the production of at least 5 maunds of madder, raised in any part of India, of which one maund to be the property of the Society.—Rs. 500, and Gold Medal.

N. B.—This prize to be renewed for three years, in the event of a specimen or specimens not being sent in by 31st December, 1858.

SUBSTITUTE FOR GUNNY CLOTH.

For the production of a cheap and efficient substitute for gunny cloth, suitable for packing sugar or grain, of which a piece of 36 yards in length, by 2 feet 3 inches in breadth, or thereabout, to be submitted to the Society.—Rs. 500, and Gold Medal.

PREMIA FOR ESSAYS ON CERTAIN SUBJECTS.

For an approved Essay on the following subjects :—

1. For the best practical Essay on the production and relative cost of the various oil seeds of India, suitable for export. A premium of Rs. 500.

2. For the best practical Essay on the present state of the cultivation of the date tree in Bengal, and the best mode of increasing its production and improving the manufacture of its sugar.—A premium of Rs. 500.

3. For the best practical Essay on the present mode of cultivating and manufacturing Indian fibre-yielding plants known in commerce, such as jute, sunn, &c., with practical suggestions for their improvement. A premium of Rs. 500.

4. For the best practical Essay on the present mode of cultivating and preparing the various tanning products of India, with practical suggestions for their improvement.—A premium of Rs. 500.

RULES FOR COMPETITION.

1. The Essays must be of a practical character, containing the results of the Writer's own observations or experiments, and not merely a compilation from books.

2. Drawings constructed to a stated scale shall accompany writings requiring them.

3. All competitors to enclose their names in a sealed cover, superscribed only with their mottos, and the subject of the Essay.

4. The President or Chairman of the Council shall open the cover on which the motto designating the Essay, to which the premium has been awarded is written, and shall declare the name of the author.

5. The Chairman of the Prize Essay Committee shall alone be empowered to open the motto paper of every essay not obtaining a premium, that he may think likely to be useful for the Society's objects, with the view of consulting the writer confidently, as to his willingness to place such Essay at the disposal of the Committee of Papers for publication.

6. The copyright of all Essays for which a premium has been awarded, shall become the property of the Society, for publication in their *Journal* or otherwise.

7. The Society are not bound to award a prize, unless they consider one of the Essays deserving of it, but may award such part of the premium as the Essay may be adjudged to deserve.

8. In all reports of experiments, the expenses shall be as accurately detailed as practicable.

9. The Calcutta bazar maund of eighty sicca weight to the seer, and the Company's Rupee, are the only weight and currency in which calculations are to be made.

10. No prize shall be given for any Essay that has already appeared in print.

11. All Essays to be addressed to the Secretary of the Society.
METCALFE HALL.

PRIZE FOR A GARDENER'S VADE-MECUM.

To any person who shall produce on or before the 31st December, 1858, the best practical treatise on gardening as applicable to Lower Bengal, or a Gardener's Vade-Mecum, the sum of Rs. 600.

The work must afford full directions for the culture of vegetables, fruits, and flowers, whether indigenous or such as have been introduced into Lower Bengal to the present time, giving practical hints on grafting, budding, pruning, and transplanting, with descriptions of soils and manures best adapted to certain plants; a calendar of operations in the kitchen, fruit, and flower garden, for every month throughout the year must be added, as also a copious alphabetical index.

CONDITIONS.

1st. The Society reserves to itself the right of withholding the above prize, should none of the treatises be approved of by the adjudicating Committee.

2nd. The Treatise to become the property of the Society for publication in its Journal, or otherwise as may be deemed fit: and one hundred copies to be placed at the disposal of the Author, free of charge.

A. H. BLECHYNDEN,

METCALFE HALL;
Calcutta, April, 1858.

Secy. A. and H. Society.

UNIVERSAL ASSURANCE SOCIETY FOR LIVES.

ESTABLISHED IN LONDON AND CALCUTTA, 1834.

Confirmed by Special Act of Parliament 6 William IV, Chapter 64.

Invested Capital: Pounds Sterling Six Hundred and Fifty Thousand, of which fifty Lacs of Rupees are held by the Indian Branch.

London Office, No. 1. King William Street.

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The marked success which has for upwards of twenty years attended the operations of this Society, justifies the Directors in calling the attention of the public to the *following peculiar advantages* held out to all classes desirous of effecting Assurances on Lives.

1st. A LARGE ACCUMULATED AS WELL AS SUBSCRIBED Capital actually invested in sound and substantial Securities, amounting to upwards of Six Million five Hundred Thousand Rupees, of which a very large portion is held by the Indian Branch.

2nd. An annual valuation and investigation into the condition of the Society's affairs, conducted most carefully on a sound and prudent basis, by which the safety of the Institution is cautiously looked to, and the profits fairly and equitably distributed amongst the participating Policy-holders. Generally speaking, too little attention is paid by the public to the manner in which Life Assurance Valuations are made. Nothing is more easy than to undervalue the Liabilities of a Society, and so represent the Profits as unusually large. Such a process, however attractive at first sight it may appear, must, if persevered in, lead to the ultimate destruction of the Society, and the non-fulfilment of its

promises. "Better a moderate profit with safety, than a large apparent profit taken out of Capital."

It is most satisfactory to the Directors of the Universal to be enabled to give assurance to the public, that the annual investigations of the Society have been made *for twenty years past*, with the utmost prudence and care, *and are based on long tested principles*, and on the *very safest Tables*, and it is not less satisfactory to be enabled to state that, notwithstanding this wise and proper caution, the profits of the Society have warranted very large annual abatements from the Premiums on participating Policies.

3rd. The Tables of Premium have been framed with the greatest care, and those applicable to Indian lives have been deduced from actual and reliable experience, obtained from the records of the India House.

It has recently been very much the practice to call for a considerable reduction in the Rates of Premium, both on Indian and English risks, and to patronize those Societies which offer the lowest terms. But *Security*, rather than a low scale of Premiums, should be the chief consideration with persons effecting Assurances on Lives. In this respect the Universal, from its large invested Capital, offers a most satisfactory guarantee for the due fulfilment of its engagements, and merits the special attention of the public.

4th Proposals are received for Assurances for the whole term of life, either on the participating or on a non-participating scale, at a lower rate of premium. Also for short periods varying from one to seven years on very moderate terms.

5th. Following is an Extract of the rates of Annual Premium for an Assurance of Rupees one thousand :—

CIVIL.

Age.	1 year.	3 years.	5 years.	7 years.	Life with profits.	Life with- out profits.	English rates.
20	22	22	23	24	42	32	£1 18 8
30	27	28	28	29	48	39	2 8 10
40	32	32	32	33	59	49	3 3 0
50	38	40	40	43	74	62	4 5 6

MILITARY.

Age.	1 year.	3 years.	5 years.	7 years.	Life with profits.	Life with- out profits.
20	26	27	28	28	47	36
30	32	32	33	31	54	45
40	39	40	40	40	63	53
50	45	46	47	48	77	64

6th. On return of Assurers to Europe, their premium are immediately reduced to the English rates, both on the participating and non-participating scales, corresponding with the age at which the Assurance was originally effected, and without reference to their state of health on arrival in England.

If the Policy be according to the participating scale, the reduction arising from the profits is allowed on the English rate, thus admitting of a continuance of the Assurance in Europe on most moderate terms.

7th. Military Officers holding Civil appointments are allowed to subscribe at the Civil rate of premium, on notice being given to the Agents of the Society.

8th. Premiums are payable either annually, half-yearly, or quarterly, and a grace of 28 days is allowed for such payments.

9th. Policies for the whole term of life, which have been in force for the full period of five years, will be purchased by the Society, or loans granted thereon to the extent of two-thirds of their estimated value.

10th. Medical Referees are remunerated by the Society, by the payment of a fee of Ten Rupees for each professional report on lives proposed for Assurance with this Institution.

11th. At the period of the last annual Valuation, the Assets of the Society were ascertained to be upwards of £650,000. The amount of Policies in force about £2,000,000, and the annual income upwards of £120,000.

Tables of rates, forms and instructions for effecting Assurances, can be obtained on application to the Secretaries, or to

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BRADDON & CO.,

Agents and Secretaries.

CALCUTTA :

May, 1858.

UNIVERSAL LIFE ASSURANCE SOCIETY.

WHOLE LIFE.

Age	CIVIL.		MILITARY AND NAVAL.		ENGLISH RATES.		
	TABLE No. 3. Annual Premiums required for the Assurance of 1,000 Rs. with participation in profits, and reduction of Premium on return to Europe	TABLE No. 5. Annual Premiums required for the Assurance of 1,000 Rs. without participation in profits, but with reduction of Premium on return to Europe	TABLE No. 4. Annual Premiums required for the Assurance of 1,000 Rs. with participation in profits, and reduction of Premium on return to Europe.	TABLE No. 6. Annual Premiums required for the Assurance of 1,000 Rs. without participation in profits, but with reduction of Premium on return to Europe.	Annual Premium for assuring £100, for the whole of life, with participation in profits. Inserted as a guide to persons insured in India under Tables Nos. 3 and 4.		
18	41	31	45	34	1 17	2	1 13 6
19	42	32	46	35	1 17	11	1 14 2
20	42	32	47	36	1 18	8	1 14 10
21	43	33	48	37	1 19	6	1 15 7
22	43	34	49	38	2 0	5	1 16 5
23	44	35	49	39	2 1	4	1 17 3
24	44	36	50	40	2 2	3	1 18 1
25	45	36	51	41	2 3	3	1 19 0
26	46	37	51	42	2 4	4	1 19 11
27	46	38	52	43	2 5	5	2 0 11
28	47	38	53	44	2 6	7	2 2 0
29	48	39	54	45	2 7	8	2 2 11
30	48	39	54	45	2 8	10	2 4 0
31	49	40	55	46	2 9	11	2 5 0
32	50	41	56	46	2 11	0	2 5 11
33	51	42	57	47	2 12	3	2 7 1
34	52	43	58	47	2 13	7	2 8 3
35	53	43	58	47	2 14	11	2 9 6
36	54	45	59	49	2 16	5	2 10 10
37	55	46	60	50	2 18	0	2 12 3
38	56	47	61	51	2 19	7	2 13 8
39	58	48	62	52	3 1	3	2 15 2
40	59	49	63	53	3 3	0	2 16 9
41	60	51	64	54	3 4	9	2 18 4
42	62	52	65	55	3 6	6	2 19 11
43	63	53	66	56	3 8	3	3 1 6
44	65	54	68	57	3 10	2	3 3 2
45	66	55	69	58	3 12	2	3 5 0
46	67	57	70	60	3 14	5	3 7 0
47	69	58	72	61	3 16	9	3 9 1
48	70	60	73	62	3 19	4	3 11 5
49	72	61	75	63	4 2	3	3 14 1
50	74	62	77	64	4 5	6	3 17 0
51	76	65	79	67	4 9	1	4 0 3
52	79	68	81	70	4 12	10	4 3 7
53	81	71	83	73	4 16	11	4 7 3
54	84	74	86	76	5 1	2	4 11 1
55	87	76	89	78	5 5	10	4 15 3
56	89	79	91	81	5 10	10	4 19 9
57	92	81	94	83	5 16	2	5 4 7
58	96	84	98	86	6 1	10	5 9 8
59	99	86	101	88	6 7	7	5 14 10
60	103	88	105	90	6 13	2	5 19 11

* * * Premiums are received in Half-yearly payments for the convenience of the Assured, but in case of lapse, the full premium of the current year will be charged.

that, if he could find them a market, they were ready to grow large quantities. I have submitted a sample to Mr. Steiner, late Superintendent of flax operations in the Punjab, and will communicate his opinion."

Mr. Stalkartt (a Member of the Fibre Committee) reports on this flax as being very soft, of good quality, and fine fibre.

19. Specimens of a substance called by the hill people "kuff" or "kuffee," the downy filament on the under side of the leaf of a plant called "sookta" (*Chaptalia gossypina*, syn. *Oreoseris lanuginosa*.) Presented by General H. C. M. Cox and Lieutenant W. A. Ross.

Before reading the following extracts of letters from General Cox and Lieutenant Ross, the Secretary stated that the "kuffee" had been several times brought to the notice of the Society, first by Dr. Falconer, in 1836; then by Major Charlton, in 1850; again by Captain Lowther in 1855; and in the early part of last year, by Captain D. Briggs; the last-named officer was requested to send several seers of it to admit of a fair experiment as to its capability for manufacturing into paper of a fine quality; but the Society had not heard further from him on the subject:—

Extract of a letter from General Cox, Mussooree, dated 3rd August 1858.—"Some months since Captain Briggs suggested to the Society, as an article calculated to make paper, the film found on the under side of the leaf of *Oreoseris lanuginosa*, which grows abundantly on these hills. Long before Captain Briggs' suggestion appeared, I had collected and taken some to England in 1855, with the intention of submitting it to some paper manufactory for trial; my brief stay at home, however, and other causes prevented my doing so. I am now collecting more of it to take home as an experiment, but without an idea, even if it answers the purpose, that it can be collected and exported in such quantity as to become an article of trade. The following result of my experiment will, I think, substantiate my opinion:—

"I had a seer of the leaves weighed and the film separated, the product was three-quarters of a chittack of film from 1 seer of the leaves, or, to state it in the nearest approximating English weight, 2lbs. avoirdupois gave 1½ oz. of film; consequently 1 cwt. or 112lbs. of the leaves would only produce 5lbs. 4 oz. of the film, and 1 ton of leaves less than 1 cwt. of the film. The plant, though common, produces only from three to four leaves, varying in size; I send you in a separate envelope four leaves, showing the different sizes, one a very large leaf, with the film unremoved from any of them, and a small quantity of the film."

In a subsequent note, dated 27th August, General Cox thus writes:—"I have the pleasure to acknowledge the receipt of your letter of the 14th instant. The maximum number of leaves on each plant is eight, the minimum three. I pay *one anna* to a cooley for a *kunder* or hill basket of leaves, weight

about 12 seers, and the product 1lb. 2oz. of the film; separating the film costs about one anna more, or two annas for 1lb. 2oz. In some cases the leaves get blighted by the continuous mist and fogs which prevail here, and on examining the under side of the leaf, one-half will often be found of a brown tinge, and whenever this is the case the film will not separate."

Extract of a letter from Lieutenant W. A. Ross (Bengal Artillery), dated Murree, 25th July 1858.—"I have the pleasure of enclosing you a substance which the natives call 'kuff,' peeled off the leaves of a plant called by the puharries 'sokhta,' and which they use instead of tinder for their matchlocks, &c. About two years ago some of my acquaintance showed me this leaf at Simla, recommending it as capital stuff for a 'feleeta' for cheeroots, and on looking at it closely, it immediately struck me that it was very like the pulp of which the finest paper is made, and I had thoughts at that time of sending some of it to Messrs. Fourdrinier, the large paper manufacturers in Staffordshire, with whom I am acquainted. But, perhaps, it will be better to send you some specimens with this brief account for publication, in order that, if paper of a finer quality is made at all in India, it may be tried here first. The plant 'sokhta' is exceedingly common in the Himalayas, and is found over their whole extent from Murree to Almorah, at both of which places, as well as Simla, I have found it. When the leaves are damp and green, the 'kuff' is peeled off the back of the leaf with great facility and quickness, so much so, that it is a peculiarly pleasant occupation, and especially suited for the small delicate fingers of women, boys or natives.

"I should think, by a little cultivation, the 'kuff' would be much increased on the back of the leaf of the 'sokhta,' and be more likely to make good paper.

"I believe the supply of rags for paper-making has very much diminished in England, so much so, that the *Times* paper has offered a large reward for a substitute. I don't think this 'kuff' would make the stronger and larger kinds of paper, but am pretty certain it would be available for that of the finest and most delicate kind. I enclose also a small leaf of the 'sokhta' plant, quite fresh and green, but I suppose it will have dried up by the time it reaches you."

In a subsequent letter, dated 2nd August, Lieutenant Ross gives the following additional particulars:—

"In reply to your letter of the 14th instant just received, I beg to assure you that I was quite aware of the notice the plant 'kuff' had formerly received from Indian botanists, as well as its capability for various manufactures, but what I wished to suggest, was its apparently peculiar susceptibility of being made into the pulp, from which the finest paper

could evidently be made, and it was I who suggested this susceptibility to Captain Briggs in walking down one day, in 1856, from Simla to Lolon.*

"The *plant* is a mere weed, and covers the whole of the unwooded hills in the *very greatest profusion*. The collection and disengagement of the down from the back of the leaf would cost little or nothing, but I will try, for your information, how much *one* cooley can obtain and disengage in *one* day.

"With regard to the 10 seers, I can easily obtain that, or a much larger quantity for you, and I will despatch it to your address as soon as possible.

"Besides the above, I will try and procure for you the following information regarding this little plant:—

"1st.—In what proximity to the plains it can be found.

"2nd.—How far in the interior of the hills, and towards the snow ditto.

"3rd.—At what season the leaf bears the greatest amount of the 'kuff.'

"4th.—If the leaf would be enlarged, or the 'kuff' increased by *cultivation*.

"With regard to the carriage in this country and freight to England of the 'kuff,' I should think it will cost less than those of most other substances, from its extreme lightness and capability of being closely packed.

"I would also beg to suggest, that as 'gun paper' has been found almost as efficient for blasting and other purposes, and a great deal cheaper than 'gun cotton,' the 'kuff,' from its already combustible nature, being largely used for tinder, might prove a very superior element in the manufacture of the former.

"At any rate, of whatever use this substance may be found, these facts regarding it are undeniable, *viz.*, that the supply is inexhaustible, the cost of collection and preparation little or nothing; and the carriage and freight as small as that of any useful substance can be."

Resolved—That on receipt of the quantity promised by Lieutenant Ross, it be forwarded to the Society of Arts for trial and report by the first paper manufacturers.

20. Samples (white and yellow) of raw silk from Deenanuggur, in the Punjab. Presented by H. Cope, Esq.

Mr. Cope states that this silk has been grown and prepared by a Cashmerian, of the name of Jaffer Ali, a resident of Deenanuggur, and that the people at Umritsur offer Rs. 16 a seer of 96 tolahs for it.

(Further particulars regarding this silk, which is considered very fair for a first experiment, will be found in the body of the proceedings.)

21. Samples of coffee and cassia from the Deyra Dhoon. Presented by H. G. Keene, Esq.

"I have despatched to your address," writes Mr. Keene, "a specimen of coffee grown by a native landholder in this district, and shall be happy to receive and communicate to him your Society's opinion thereon. I have put in with the coffee specimens of cinnamon (or cassia ?) from Jounsa Bawur, the hill pergunnahs of this district. Two or 3,000 lbs. are now available."

The coffee had, unfortunately, been put in an air-tight tin box in a green state, and had, consequently, reached in too mouldy a condition to admit of a fair opinion being formed, but it seemed to a member of the Committee to be a good description of coffee. The cassia is pronounced of good quality.

Nursery Garden.

The Officiating Gardener's monthly report was submitted. After alluding to the receipt of cases of plants from Captain Power of Rangoon, and the Botanical Garden at Jamaica, Mr. Manuel proceeds as follows :—

"The imported vegetable seeds received for the present season are from Messrs. Gibbs and Co., of London; Messrs. Villet and Sons and Mr. Templeman, both of the Cape; and Messrs. David Landreth and Sons, of Philadelphia. All the trial sowings were immediately made in the usual way, after examining each packet, which I found in good condition. The tabular statement of each sowing I beg to enclose.

"Of the entire batch I found the American seeds to be unexceptionable, and feel greatly satisfied with the result. I may add that the present importation is, I consider, far superior to that of last year. As I had made both sowings myself, and had carefully watched their progress, the result fairly shows the present to be superior to that of the past season; and I expect, when the regular sowing season arrives, the issue will fully bear out my expectation.

"Next to the American seeds is that of Messrs. Villet and Sons, whose imported seeds of the present year are fully equal to that of the last; and I may add, that from the past year's seeds I took great care in rearing the onions and celery, both of which had germinated very satisfactorily; both were laid out in open beds, where they remained for the whole of the year, withstood the severe heat of this year, and the heavy rains of July and August. The celery is now coming into bloom, and I expect it will seed.

"Mr. Templeman's comes next in the list, and which I find as good as that of last year; though a few failed to germinate, yet I consider, if I allow another trial, it may redeem their character. When the season for laying all out in the open ground freely admits of doing so, it will be carefully watched to mark its progress, and the result accordingly submitted.

"As to the seeds received from Messrs. Gibbs and Co., a little disappointment is felt, inasmuch as the result of the past years shows better than that of the present, as will be seen from the tabular statement of the present year's sowing. Besides this sowing I gave another trial, but the result proved as unsatisfactory. I am unable to attribute the failure of the few seeds to any reasonable cause, as the seeds seemed to be fresh on examination. The only cause to which this can be attributed is that, perhaps, such seeds were in a package which might have been stowed in some part of the ship where excessive heat may have destroyed their germinating properties. The seeds received last year were very good, as each kind of field crop had not only freely germinated, but yielded a good return, especially the carrots, turnips, raddish, and the far superior beet which, in size, both yellow and red, was astonishingly great.

"Of the vegetable seeds received from Messrs. Carter and Co., by overland, and the report of the trial sowing given in my last, I beg to add that since then the following seeds have germinated, and I consider has yielded a good return.

Cabbage, Carter's matchless,	yielding 40 per cent.		
Endive, curled,	do.	50	do.
Lettuce, compact,	do.	30	do.
Parsley,	do.	70	do.
Spinach,	do.	30	do.

And the number failed are the celery, leek, onion and Brussels sprouts.

"I beg to forward for distribution the present year's crop of maize raised from the acclimated seeds, the produce of the garden of past year. These I raised from a small quantity of seeds which I had retained for sowing in the present year. Of the imported American seeds of last year, the quantity I had retained for sowing, I regret to say that I failed to obtain a crop. Of a quantity which had germinated, some withstood the severe heat of the past season, but others flagged much, and, consequently, gave no produce. As both seeds were simultaneously laid down, the failure of American seeds I attribute to the excessive heat which prevailed at the time, and which was, the least to be said, unexpected, the average Fahrenheit averaging from 130° to 132° out-doors. The small quantity of seeds I received from Mr. Butler, I had retained for a more favorable season, and when these were laid down, the sudden heavy showers of rain tended much to destroy them; however, I have obtained a small crop, which I consider to be satisfactory. They are of good kind, and full in ear.

"I regret to add that the same unfortunate result attended the present year's crop of jute, and the two kinds of *Hibiscus*, (the sorrel plants.) Though the seeds freely germinated, yet, owing to excessive heat and want of

good showers of rain at the time of germination, all the plants have, more or less, suffered in being stunted—and though the rains came on pretty well in July and August, yet the plants could not well revive—and now the rains having so suddenly ceased, and the sun again becoming powerfully hot, will tend to no good benefit to these plants before they come to maturity. But I may say that, in looking to the growth of the plants laid out by the ryots in the fields adjacent to the garden, I find mine to be of better growth ; the poor people lamenting much their loss in the jute and sugar-cane crops, which, to them, have been a complete loss.

“I also regret to say that the English acorn seeds received from Reverend Dr. T. Boaz have failed to germinate. The failure of these I chiefly attribute to their arriving here too late in the season.

“As the season freely admits of planting out fruit grafts and other trees, I may add that I have still remaining some mango and other grafts, and have added to the stock of ready grafts of peaches of all kinds, and a few, about five kinds, of pummelows—and other grafts—all of which are available to members. Besides these, I have remaining out of the batch of plants presented by Dr. Thomson, of the Honorable Company’s Botanic Garden, some good and ornamental kinds of plants, and fine timber-yielding trees, which would make good plants for large and extensive gardens, and which can be had on payment of pot charges. These plants comprise various kinds of palms and other trees, *viz.* *Guatterias*, *Dilleinas*, *Bauhinias*, *Semecarpus*, *Mimusops*, *Gardenias*, *Michelias*, *Carreyas*, *Sapindus*, *Pterospermum*, *Aglaias*, *Berryas*, *Shoreas*, *Neriums*, *Bignonias* *Nephilum*, and *Combretums*.

“I beg to forward specimens of fibres from three kinds of fibre-yielding plants: two are from the *Papeng shaw*, which I failed to extract last year ; one from *Sida rhomboidea*, and one of dhuncha, which I had likewise failed to extract last year. The experiment made on the *Papeng shaw* was in two ways, and the result, as succeeded, is now submitted. One process was, that I stripped the bark and immersed it in water, keeping the same for fifteen days ; and the other was to strip the bark and to allow the process of fermentation to take place before immersing the same in water, which took place in forty-eight hours, and remained immersed in water for seventeen days, when I had them washed, and the refuse separated from the bark. I believe, as the specimen will show, that the bark does not admit of the process of fermentation, as that which is without has yielded a finer description of fibre, but the period it has taken to complete is, I consider, too long ; but this, I believe, arises in consequence of the plants being taken before they have arrived at maturity, and, therefore, I intend to make another experiment. The dhuncha fibres are extracted in the same way, and I don’t think, unless they are stripped of the bark, it will admit of their being extracted. Of the whole, I

consider the fibres of *Sida* to be the best ; however, I submit all for inspection of the meeting.

“ I also beg to forward two brinjals, the produce from the seeds received from Bombay, from Mr. C. B. Morgan. These are medium-sized ones, as those of the largest kind have run into seed, and therefore unable to send them for your inspection. I am of opinion that these brinjals are of very superior kind ; the largest, which is nearly treble its size, were found to be very tender and fine flavored, and therefore worthy of cultivation as the best of its kind.”

The recommendation of the Council, submitted at the last meeting, that the Rev. T. C. Firminger be elected a member of the Council in the room of Mr. George May, who has left India, was next brought forward and unanimously agreed to.

Fibres from Darjeeling.

A report was read from Mr. Stalkartt on the three samples of nettle fibres from Darjeeling, presented by Captain Masson, at a recent meeting, of which the following is an extract :—“ A portion of each of these musters has been passed over a flax heckle which, with its tow, I return. The fibre is strong, fine, and would make a good and, perhaps, superior substitute for flax, and might enter into the composition of linen fabrics ; its value can scarcely be determined here, but should be sent to the Chamber of Commerce, at Dundee, for valuation and demand. I beg that one portion (which has been heckled) be sent to Captain Masson, to guide him respecting the getting up of the material, which is absolutely necessary to make it sought after, with a view to large transactions. The preparers of this nettle and pooah fibres, after twisting it to take out the water, should be more careful when spreading it out to dry to twist it back again, and lay every fibre perfectly straight, or, in the process of heckling it, there will be a large proportion of tow, which should be avoided.”

Ordered—That a copy of the above report, and the prepared samples, be forwarded to Captain Masson.

**Silk Culture at Deenanagur, in the Punjab.*

Read the following letter from Mr. H. Cope, dated Umritsur, 7th June, on the above subject :—

“ Since I had the honor to forward my impressions regarding the introduction of the silk-worm into the Punjab, I have had some opportunities of seeing how really great are the advantages available in support of such a measure. I have seen vast tracts of waste lands, situated at the foot of the

hills, suited, in an especial manner, to the cultivation of the mulberry tree : better still I have seen in almost every village through which I have passed magnificent mulberry trees that would afford food for countless numbers of worms, and I have learnt that a considerable number of the Mahomedan population would undertake the rearing of these worms if they could see their way clearly.

" Amongst other places visited was Deenanuggur, a commercial entrepôt of some importance, situate in a fertile part of the Goordaspore district, near enough to the hills, to derive some advantage from that proximity with the Huslee Canal passing through its lands, and the promise of enlarged irrigation when the works of the Baree Doab Canal shall have been completed. It is not mentioned in any previous paper as one of those localities in which the silk-worm has, at any time, been introduced, but is admirably adapted for such an experiment. The mulberry abounds, and the climate is suitable in March and April.

" I was, therefore, much gratified to learn that a Cashmeeree, named Jaffer, with his son Rehman, had been engaged, for the last three or four years, in rearing the silk-worm ; that he had this year obtained 4 seers of silk, and was finally so well satisfied with his prospects of success, that he had *purchased* 8 beegahs of land for the purpose of forming a mulberry plantation, and this without any communication with, or encouragement, direct or indirect, from the European officers of the district. I had not time to see the man myself, but the facts are beyond a doubt, as I have ascertained through the obliging enquiries of Mr. Naesmyth, Deputy Commissioner of Goordaspore, and I believe it is the intention of that zealous officer to recommend Jaffer and his son to the consideration of Government, as deserving some pecuniary reward for their enterprise.

" I venture to consider this man deserving some mark of approbation at the hands of your Society, and that such a mark, bestowed through the local authorities, would have a very good effect in encouraging others to follow the excellent example set.

" I shall probably have early occasion again to visit Deenanuggur, and will report more fully on the experiment, but in the meantime beg to be allowed to recommend that the Society present Jaffer with a silver medal and a certificate in Persian, *on parchment* (heir-loom of this kind are very highly prized), stating that the members have heard with satisfaction of his efforts to raise silk at Deenanuggur, and hope they will meet with the success they deserve, or something to that effect.

" P. S.—I ought to have mentioned above that hitherto Jaffer has purchased leaves from the owners of *mulberry* trees, on which to feed his worms of the past year."

Read also a letter from Mr. Naesmyth, Deputy Commissioner of Goordaspore, dated 28th August :—

“ In reply to your note of the 7th instant, I have the pleasure to reply as follows :—

- “ 1. Jaffer Ali has cultivated, with mulberry, 4 acres and 3 roods of land.
 - “ 2. He has cultivated the land for this purpose since May 1856.
 - “ 3. He has cultivated the above solely for silk-worm feeding.
 - “ 4. He has introduced the worm in his cultivation, which is progressing favorably.
 - “ 5. The above was entirely his own doing, and not at the instigation of any government official.
 - “ 6. He is anxious to extend the cultivation.
 - “ 7. Jaffer is the sole cultivator.
 - “ 8. I think the donation of a medal from the Society would be prized, and would
 - “ 9. Be likely to induce others to follow his example.
 - “ 10. The part of the country is well adapted for silk-worm feeding.
- “ I shall be glad to supply any further information which may be required. Jaffer Ali has, at my recommendation, received a cash donation of Rs. 50 from Government for his exertions.”
- Submitted also a recommendation from the Council, to the effect that the Society award its silver medal, with a suitable inscription in Persian, to Jaffer Ali, for the reasons set forth in the above communications.
- Baboo Peary Chand desired to give notice of a motion to the above effect, for disposal at the next meeting.
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The following extract from the proceedings of the Council, at their monthly meetings, held in August and September, were submitted, and ordered to be incorporated in the proceedings of this day's meeting :—

“ That a Sub-Committee, composed of the Reverend J. Long, Mr. W. G. Rose, and Baboo Peary Chand Mittra, be appointed for the purpose of reporting on the feasibility, or otherwise, of the establishment of Agricultural Schools in Bengal and the Upper Provinces, at the next meeting of the Council.”

“ In consequence of the publication of an extract from the despatch of the Court of Directors, requesting the Government not to incur any further expenditure in the Education Department, we beg to recommend that the consideration of the question, on which we have been requested to report, be postponed, until there is a change in the circumstances of the country to warrant the Society taking it up again.”

PEARY CHAND MITTRA.
W. G. ROSE.

.Communications on various subjects.

The following papers were likewise submitted :—

1. From Lieutenant R. Stewart, an interesting report on the progress of tea cultivation in Cachar.

The best thanks of the Society were voted to Lieutenant Stewart, and his paper transferred for publication in the number of the journal now in the press.

2. From Lieutenant J. F. Pogson, further remarks respecting a description of silk-worm found at Simla, and the fibre of the behul (*Grewia oppositifolia*), and rope made therefrom. Mr. Pogson also alludes to the recent flowering of the bamboo at Simla as follows :—

“ A good deal of curiosity seems to have been excited amongst horticulturists at the flowering of the bamboo, of which we have in these hills three kinds, *viz.* the gigantic or large, hollow bamboo, the female bamboo, which is seldom more than an inch and a half in diameter, and the solid or male bamboo, which is perhaps a trifle thicker than the above. This year all three kinds have flowered far and wide. In addition to these true bamboos, we have a bastard bamboo, called the nig-aulee ; this is seldom more than three-quarters of an inch in diameter, and from 12 to 16 feet in height. It is very hardy, bears intense cold, grows luxuriantly on the crest of the Nagkunda Pass, as also on Huttoo, and on a spur of the Shaitool Pass, height 9,500 feet. It is a very graceful variety of the bamboo, and is a great ornament to the flower garden. I will write up and ascertain if this too has flowered.”

3. From the Secretary Local Committee, Public Instruction, Baraset, enclosing the following extract from the Annual Report of the Baraset Government School :—

“ The boys read *Chambers' Vegetable Physiology*, which has been made a part of the scholarship course, and cultivated separate pieces of ground, as in the last year. Three of them have been deemed deserving of prizes, to be given out of the proceeds of the sale of produce.

“ It has been proposed to invite sons of the agricultural people, say ten in number, by pecuniary inducements to work in the garden with the mallis, and to receive lessons in the elements of the Bengali language, so as to be able to read easy books on agriculture in that language. The pundit of the school is willing to give the necessary instruction at his leisure hours, on receiving a small remuneration. Owing to various circumstances, the proposition has not been carried into effect. The expense requisite for this purpose can be paid out of the surplus funds of the garden.

“ The following presents of seeds have been received from the Agricultural and Horticultural Society of Calcutta : seeds of trees and shrubs 64 sorts, Cape vegetable seeds 32 sorts, and cereals of sorts, and seeds of field crops 16

sorts. The seeds of trees and shrubs having been received in June, I had the pleasure of personally watching their progress through the various stages of growth, and am happy to find at this moment, that most of those young plants which were transplanted under my own direction, have attained to full vigor. The vegetable seeds and some of the cereals I could see sown; but of their subsequent development I know nothing, having been at that time transferred from Baraset; but I have been told, and feel pretty certain, that the vegetables grew tolerably well, but that the cereals did not germinate even."

4. From Dr. E. Balfour, Madras, presenting two copies of his *Cyclopædia*, and returning thanks for certain publications of the Society.

5. From Dr. Alexander Gibson, Superintendent Botanic Gardens, Bombay, mentioning in reply to an enquiry that he does not possess the Cape thatching grass (*Restio tectorum*.) "The only foreign grass I had for some time," adds Dr. Gibson, "was the tussack of the Falkland Islands, and this soon found the place too hot to hold it, and died off."

6. From J. Cowell, Esq., tendering his resignation of the various Committees to which he belongs, in consequence of his approaching departure from India.

7. From R. B. Chapman, Esq., Under-Secretary Government of India, enclosing copy of a letter from Monsr. Laget, of the Department of Gard (France), expressive of his desire to open a communication with some residents in India, for the supply of Indian silk-worm eggs for trial in India.

Resolved—That an abstract of this letter be entered in the proceedings for the information of those interested in the subject.

8. From Signor F. Lotteri, alludes to the prizes offered in former years by the Society for unwinding the eri silk cocoon; states that he has been successful in Europe, as the letters and pamphlets accompanying his letter will show; and that it should form a part of the instruction to be given in the school which he suggested the Society in his former letter to establish.

Resolved—That it be suggested to Signor Lotteri to communicate with the Industrial Arts Society, the subject of his former letter coming more within their province than of this Society.

9. From J. H. Allen, Esq., Manager N. W. Dāk-Company, intimating his readiness, with reference to the communication from the Commissioner of Oude, read at the last meeting, to send, free of cost, to Cawnpore, boxes of seeds for the soldiers' gardens at Lucknow, to the extent of 100 maunds.

Resolved—That the best acknowledgments of the Society be given to Mr. Allen for his most liberal offer, which the Secretary stated he had lost no time in accepting.

10. From R. Montgomery, Esq., tendering his best thanks to the Society for the liberal supply of seeds furnished him, and to the Agent N. W. Dāk

Company, for sending them, free of all cost. Mr. Montgomery adds that the boxes had reached him in a very short period.

11. From the Deputy Quarter Master General of the Army, requesting the transmission to the officer commanding at Benares, for the use of the troops at that station, of a good supply of vegetable and flower seeds.

The Secretary announced that no time had been lost in meeting this application.

12. From C. E. Chapman, Magistrate of Dinagepore, requesting a supply of vegetable seeds for the use of the Naval Brigade (100 men) at that station.

Ordered—That this application be met to the best of the Society's ability.

13. From Mr. J. Templeman, seedsman, Cape of Good Hope, advising despatch of a trial assortment of vegetable seeds.

14. From Messrs. Villet and Son, intimating the despatch, per *Gipsy Bride*, of the Society's annual consignment of vegetable seeds.

The Secretary mentioned that the letter of advice was sent by the *Defiance*, which did not leave for nearly a month after the *Gipsy Bride*, and as, moreover, the seedsmen had not addressed the cases properly, they did not reach the Society's rooms till three weeks after the arrival of the latter vessel.

Resolved—That Messrs. Villet be apprised of their carelessness, and be cautioned to adopt measures to prevent a repetition of such culpable neglect of the interests of the Society.

For all the above donations and communications the best thanks of the Society were accorded.

(Monday, the 4th October 1858.)

Baboo Peary Chand Mittra, Vice-President, in the chair.

The minutes of the last General Meeting were read and confirmed; and the following gentlemen, proposed on that occasion, were elected members:—

Lieutenant T. F. O. Scott, Captain R. C. Birch, Major H. W. Blake; Messrs. G. F. Kelner, G. F. Lord, J. B. Roberts, J. W. H. Ilberry, R. A. Wood, and C. H. Barnes; Drs. B. Kendall, and James Allan; Messrs. H. T. Prinsep, Hartley Watson, C. Paterson, and R. S. Moncrieff.

The names of the following gentlemen were submitted as candidates for election:—

Hugh Leonard, Esq., C. E., Superintendent of the Mutla,—proposed by Mr. J. F. Galiffe, seconded by the Secretary.

Colonel C. J. B. Riddell, C. B., Royal Artillery, Benares,—proposed by Sir Arthur Buller, seconded by Dr. A. H. Cheek.

W. U. Eddis, Esq., Hizlabut Factory, Pubna,—proposed by Mr. H. G. French, seconded by Mr. G. R. French.

Lieutenant Malcohn G. Clerk, (D. P. W.,) Lucknow,—proposed by Mr. C. A. Cantor, seconded by the Secretary.

George Macleod, Esq., Rajapore Factory, Rajshaye,—proposed by Bahoo Peary Chand Mittra, seconded by Mr. W. G. Rose.

John Ogilvie Hay, Esq., Merchant, Akyab,—proposed by Mr. D. B. Lindsay, seconded by Mr. W. Stalkartt.

Joseph Graham, Esq., Barrister at Law,—proposed by Mr. Longueville Clarke, seconded by Mr. W. G. Rose.

The following contributions were announced :—

1. A pamphlet, entitled “The Port of Calcutta and the Port of Mutla, considered in connection by a railway or ship canal.” Presented by S. H. Robinson, Esq.

2. Selections No. 2, from the public correspondence, &c., of the British Indian Association. Presented by the Association.

3. Twenty barrels of New Orleans cotton Seed. Presented by the Cotton Supply Association of Manchester.

It was resolved that this seed be advertised for distribution among members and the public generally, on the terms proposed in the letter of the Association, which was submitted at the July Meeting, namely, that the recipients undertake to furnish reports of the result of their sowings.

4. Three kinds of seeds from Upper Assam. Presented by Captain W. H. Lowther.

The following is extract of Captain Lowther's letter, descriptive of these seeds :—

“I send you by letter dāk, so as to reach you for this season's sowing, sundry seeds :—1st.—Seeds of a promising ‘Cissus,’ or wild vine—a jungle in these parts, and bearing a great abundance of capital racemes of sub-acid berries—*grapes* in fact in their pristine and savage luxuriance. I believe Major Smith attempted wine from them, but only succeeded in obtaining vinegar: there can, however, be no doubt that, in the hands of some experienced manufacturer, they would produce a good and cheap claret in the mild temperature (70°) of Suddyah. Also this hardy plant would, no doubt, furnish excellent stocks for the grape vine, which, in our moist climate, will not bear fruit, but runs to wood and leaf. The local name of this climber is ‘*Lutta Paniyal*,’ and the fruit is much sought after by the omnivorous Assamese.

“2nd.—Seeds of ‘*Flacourtia cataphracta*,’ *Paniyal* of Assam. A small tree, thorny, and bearing abundantly a very pleasant sub-acid kind of plum, much hunted after by the natives; to judge by the flavor it would make

excellent jam or chutnee,—however, you may possibly possess both this and the next described fruit, and I therefore enclose a very small amount of seeds pending that information.

“3rd.—‘*Pierardia sapida*,’ or *Lutkoo*, in my opinion, ranks next to its delicious congener, the ‘litchi,’ for which it would, no doubt, furnish famous stocks, being of large growth, and very full of sap. In our jungles the tree attains an immense size: the fruits load the branches almost to their destruction, and attain a perfection which, under culture, promises to render it an esteemed dainty. It is occasionally met with in gardens and enclosures, but seems to prefer the rank moisture and shade of the indigenous woodlands, in company with *Garcinia pedunculata*, *Dillenia speciosa*, and other shade-loving vegetation.

“The *Lutkoo* is sold during the season in all our markets, and appears to be in great request among the laboring classes as a quencher of thirst.

“4th.—I have obtained a true specific for ring-worm, among the very numerous family of *Ruellidæ*, with which every part of Assam appears to swarm. The local name is ‘*Khar-mar*,’ literally *ring-worm killer*, and indeed it richly deserves the appellation, to judge by its immediate effects in old cases of years’ duration, where the patients were covered with that troublesome eruption from head to foot. The mode of application is this:—A sliced lemon, or the bruised point of a thorny ‘*Solamun*,’ is first well rubbed on the affected parts, until irritation is produced, then a handful of the *Khar-mar* leaves, slightly bruised, and applied with sufficient force to cause pain, and produce friction: a quantity of black juice (evidently a *dye*, and having the smell of indigo) exudes from them, and appears, by its penetrating astringency, to arrest the progress of the skin disease. I have not yet seen the flower or seed-vessel of this *Ruellia*, but shall send you plants when I have an opportunity.”

5. Specimen of wild paddy from the vicinity of Tumlook. Presented by W. Terry, Esq.

Mr. Terry writes that this wild paddy grows in any quantity in marshy salt-water land near to Tumlook.

6. Specimen of stick lac from Cuttack, gathered on the *koosum* tree (*Schleichera trijuga*). Presented by J. L. Atkinson, Esq.

7. A small sample of cotton raised in his grant in the Soonderbunds from Sea Island seed. Presented by Baboo Gyanendramohun Tagore. This cotton is considered of pretty fair quality, though not equal to the samples recently submitted to the Society, which have been raised in the same locality from the same description of seed.

The motion, of which notice was given at the last Meeting by Baboo Peary Chand Mittra, that a silver medal be awarded to Jaffer Ali, of Deenanuggur,

with a suitable inscription in Persian, for his successful efforts at cultivating silk in that locality, was brought forward, seconded by Mr. W. G. Rose, and carried unanimously.

Nursery Garden.

The Gardener's monthly report was submitted, of which the following are extracts :—

"In submitting my report for the past month, I beg to state that I received two kinds of American cotton seeds from Messrs. D. Landreth and Sons of Philadelphia, *viz.*, the Sea Island cotton and Petti-Gulf cotton, and they were as usual sown in trial gunlows; and the result, I am happy to communicate, is very satisfactory, the former yielding cent. per cent., and the latter 70 per cent., and that both had freely germinated within 48 hours.

"The Cape seeds from Mr. J. Upjohn, of the Cape of Good Hope, being recently received, I have had only time to sow them for trial, the result I shall have pleasure in communicating at a future date, but I may state that the packet contains 39 kinds of good vegetable seeds, and which I consider to be well assorted, and forms a very good collection, much better than that of Messrs. Villet and Sons, or Mr. Templeman.

"The few country vegetable seeds received from Mr. C. Blechynden, I consider to be of good kind and deserving of attention, and for which reason I have laid them out in the open ground in the kitchen garden. I have every reason to hope the seeds will freely germinate, and as to the tubers some have already begun to sprout out.

"In the orchard I have a large collection of the Chinese green dye plants available for members, and I may say that the present season offers the most favorable opportunity to lay out these plants where they are intended to be cultivated. The spot to be selected must be only free from heavy damp, such as any place in which water may be lodged at any considerable time, say about 36 hours or above. The plants make a healthy and vigorous growth after they are pruned or headed at the usual season of the year, and which, I perceive, has been the case with those in the garden since heading them.

"The rutmeg and mangosteen plants, received from Mr. Antony of Penang, in October last, and in health, are now in the best condition imaginable: a few I had planted out in open ground in the orchard among the mango trees, and I may say, much contrary to my expectation and to my very great surprize, I find them thriving in a vigorous state of health. I make these remarks particularly, as in my former trials I had not only failed to succeed in rearing them, but such as were put in the open ground had all, after a short period of duration, withered off. All the coffee

plants, with indeed, a few exceptions, laid out in the mango plots, are doing well.

"I have now added to the ready stock a large collection of 19 kinds of peaches, all kinds of mangoes and pummelows, the two kinds of eugenias; also custard apple, liches, guavas, a few cherries, wampie, and assorted limes, lemons, and a few mandarine oranges, with Noakolly and other kinds, and also all the varieties of pine-apples; and about 200 young runners from the small stock of the strawberry, which are now in a most healthy state, and ready for distribution to any members in want of them. A list of the members, whose names are registered, will be soon forwarded, with a view that they may be informed of the same.

"In the Kitchen Garden, besides the preparation of beds for laying out all kinds of vegetable seeds for the ensuing season, I beg to state that I have prepared a small spot in laying out the maize seeds received from America from Messrs. D. Landreth and Sons—which being the present year's importation, with a view to raise a few acclimated seeds of the same, which are of 9 kinds—and of each 200 seeds have been put into the ground. The result, I am glad to state, fully bears out the report submitted in the trial sowing, and that all the seeds have freely germinated, and yielded a return fully bearing out my trial reports. The only seed failed is the Stowell's evergreen sugar-corn.

"The cotton plants laid out in different plots are doing as well as can be expected; those from the seeds of Mr. Blundell's imported Sea Island cotton and of Mr. J. M. Hall's Egyptian cotton seeds, sown next to the Conservatory, have attained a height of 7 and 8 feet, and are now getting into full blossom. The Petti-Gulf cotton seeds received last year from America have likewise made a good growth, and are in bloom.

"The fibre-yielding plant, called the *Papeng Shaw*, has attained this year the height of nearly 4 and 5 feet, with fine healthy broad leaves, which speaks much of the plant running into vigor, and I hope I shall be able to extract a large quantity of its fibre in due time to enable the same to be properly tested.

"In the Flower Garden I have much pleasure in stating that the repairs of the Conservatory are completely finished, and I have removed there all my tender habit plants, where they have now started up in vigor, though I regret to say that, owing to the want of such protection during the past season's heavy rains, have caused me to lose many of my fine healthy plants of carnation and picoties; the few now remaining are doing well. The *Hoya* plant, presented by Rajah Nursingchunder Roy, in March last, has now come into flower, which is indeed of a very pretty description. The *Mussanda speciosa*, received from Mr. S. P. Griffiths, being one of the batch of the Java plants, is now flowering; this also bears a very pretty flower.

"I now beg to send three kinds of fibres, as specimens, to be laid before the committee; the first is No. 1, a trial experiment of fibre extracted from pine-apple leaf. This is my first experiment in it. The fibre appears to me to be rather coarse. The second is No. 2, from the *Agave lurida*; this is likewise my first experiment in it. I consider the fibre to be good and of good length, but rather coarse, taking more towards hemp or flax than that for jute and such like fibres. The third is Jubbulpore hemp (*Crotalaria tenuifolia*), which is also my first experiment, but I consider this fibre to be much inferior to that usually produced in its native place, and the strength and durability I also consider much inferior, though this might be improved if another experiment were made.

"The pine-apple fibre I have succeeded in extracting, after having pressed the leaves under a roller to extract the sap it contained, and then to steep the same for nearly a week in water, and then to take off the refuse gently with fore-finger and thumb, and afterwards to wash them properly in clean water to separate any refuse that might have adhered to it. The process for the *Agave lurida* was nearly the same, and the Jubbulpore hemp was, after stripping the bark from the stock, taken from the lowest end. To none of which I allow the process of fermentation, and therefore can't say what and how the result would turn under that process. I also send two stems of *Aralia papyrifera* (*China rice paper plant*), having dried and varnished them with the view that they may be laid before the committee, and added to the collection in the museum."

Artificial Irrigation on Cotton Crops.

Read a letter from the Government of India, with its enclosure, a summary of papers on the subject of the effect of artificial irrigation on cotton crops.

Suggestions for Agricultural Improvements.

Read the following letter from Baboo Puddunlochun Mundul, Zemindar at Balasore :—

"To the Secretary of the Agricultural and Horticultural Society.

"SIR,—I beg to draw your attention to the following points regarding the system of agriculture, that being followed out, will, in my humble opinion, lead to the progress and prosperity of that most useful art.

"1st.—That the Society is very diligent to promote the agricultural labor and produce of our land: but its diligence is not so directed as to have a result equal to reward, or rather to recompense, the labor and expense undergone.

"2nd.—That, for this reason, the Society may look after those districts where such a recompense is more probable than in other districts; and that

in the former the Society should not only establish a regular system of agriculture, but also encourage it as much as it lies in its power.

"3rd.—That the Society should enquire into the necessity of particular agricultural products in particular districts, and should, accordingly, deal out lands for the raising of them.

"4th.—That in every district the agricultural art should be made to practise, and be encouraged in proportion to the consumption therein of the products; and that rewards be given from time to time in order to attract the laboring class to the pursuit of the art.

"5th.—That, for an illustration, the Society is referred to the district of Balasore. The major portion of its soil is rich and productive. The demand there of the tobacco, the potato, the cotton, the flax, the hemp, the sugar-cane, &c., being very high, these articles are imported from other places; the flax, the hemp, and sugar-cane are indeed raised there with much difficulty and little success.

"Lastly.—That it is desirable that the laboring class of every district of such description should be versed with the principles of agriculture; and that the landholders of that district may readily co-operate with the Society by appropriating their land (if needs be of them) to its use, and by offering pecuniary contributions to the funds that may be raised to execute its grand and noble object.

"Calcutta, 19th September 1858."

Resolved—On the recommendation of the Council, that the Baboo be informed that the Society are quite willing to co-operate with him in any practicable suggestions he may make in regard to improvements in his district. That they propose that he and the other wealthy and influential Zemindars at Balasore form a Branch Society to co-operate with this Society for the introduction of useful seeds and plants, and for such other purposes as may be suggested, with the view of attaining the desired object.

Communications on various subjects.

The following letters were also submitted:—

1. From Lieutenant R. Stewart, Officiating Superintendent of Cachar, enclosing copy of a programme of a Fair to be held in Cachar next cold season for five days, from the 30th December to 3rd January 1858-59, and applying for seeds of sorts for distribution on the occasion. "The mela has been very widely advertised in Sylhet and Cachar," writes Lieutenant Stewart, "among the Hill Tribes, and to the east, and there is every reason to believe that it will be largely attended. Would this not form an excellent opportunity for the distribution of seed, both vegetable and corn, among a people who are proverbial for their poverty in the variety of their food?"

"2nd.—Should the Society approve of this proposition, I shall be very glad to undertake the distribution of any quantity that you may send up. Nothing in the way of a vegetable can be amiss, but I would recommend the coarse and larger kind of garden pea, the field pea and bean, different descriptions of doll, gram, large cabbage, field carrots and turnips, potatoes, onions, mangel warzel, raddish, oats, barley, wheat, varieties of rice, mustard seed, linseed, sesamum, flax, hemp, cotton; the seed of native or acclimatized fruit trees, also that of good timber trees, as forming the best assortment that could be sent up.

"3rd.—Prizes are this year to be offered at the mela for the best description of cattle produced for sale: these will comprize elephants, ponies, both Munni-poorie and Burmah, buffaloes, cows, and goats. It might be given out, while distributing these seeds, that next year prizes would be given for the best samples of their products."

Resolved.—That as large a supply of seeds as can be spared be forwarded immediately to Lieutenant Stewart, for the purpose indicated in his letter. .

2. From Captain Thomas Hutton, Superintendent Himalayan Mulberry Plantation, Mussooree, intimating that the Government has sanctioned an experiment with his wild *Bombyx* (*B. Huttoni*;) and applying for eggs of all other kinds of silk-worms, wild and cultivated, that can be procured, for a series of experiments which he is desirous of instituting on silk-spinners generally.

The Secretary intimated that he had lost no time in writing to various correspondents, with the view of giving effect to Captain Hutton's application.

3. From J. L. Atkinson, Esq., Cuttack, expressing his wish to attempt silk cultivation at Cuttack, and asking for information on the subject, and for eggs. Mr. Atkinson observes:—"I am now trying whether by feeding the Tussur worm of this country on white mulberry leaves, and making them spin in paper funnels, will at all improve the Tussur silk. Cocoons of Tussur silk are to be had plentifully here, but more so in Colehan, where they are allowed to grow wild, little or no care being taken of them. The natives here boil the cocoons for twelve hours and wind the silk, causing a great wastage, and useless expenditure of labor, as well as discoloring the silk, making it more yellowish. 525 cocoons, wound in the native system, yield a seer of silk, of 105 tolas, and is sold for rupees 5 only. Is it at all cheap? And will careful feeding and winding at all be worth speculating upon?"

4. From Mr. J. Upjohn, of the Cape of Good Hope, advising despatch of a trial assortment of vegetable seeds. (Received and under trial in the garden.)

5. From Messrs. James Carter and Co., forwarding the Society's annual consignment of flower seeds. (Received and now in course of distribution.)

For all the above communications and presentations the best thanks of the Society were accorded.

(Wednesday, the 10th November 1858.)

The Honorable Sir Arthur Buller, President, in the chair.

The minutes of the last General Meeting were read and confirmed.

The following gentlemen, proposed at the last meeting, were elected members :—

Colonel C. J. B. Riddell, C. B.; Lieutenant Malcolm G. Clerk; Messrs. Hugh Leonard, W. U. Eddis, George Macleod, J. O. Hay and Joseph Graham.

The names of the following gentlemen were submitted as candidates for election :—

Alexander Ross, Esq., C. S., Civil and Sessions Judge of Furruckabad,—proposed by Mr. R. Berkely, seconded by the Secretary.

J. W. Maseyk, Esq., Indigo Planter, Malda,—proposed by Mr. J. J. Gray, seconded by Mr. H. Maseyk.

P. Augier, Esq., Calcutta Mint,—proposed by Mr. A. N. Clarke, seconded by Baboo Hurreemohun Sen.

M. W. Townsend, Esq., of Serampore,—proposed by Mr. M. Wylie, seconded by the Secretary.

A. Maclean, Esq., C. S., Kishnaghur,—proposed by Mr. A. Grote, seconded by Dr. Thomas Thomson.

E. A. Dow, Esq., Solicitor, Supreme Court,—proposed by Mr. Joseph Agabeg, seconded by the Secretary.

Captain H. Raban (36th N. I.), Calcutta,—proposed by Mr. Grote, seconded by Dr. Thomson.

The Secretary for the time being, Artillery, Head Quarter Mess,—proposed by the Secretary, seconded by Mr. C. A. Cantor.

F. Read, Esq., Superintendent of Irrigation, Rohilkund,—proposed by Major General J. T. Lane, C. B., seconded by the Secretary.

C. Connew, Esq., Calcutta,—proposed by Mr. T. H. Bennet, seconded by Mr. W. G. Rose.

T. J. Knox, Esq., Madras Civil Service, Vizagapatam,—proposed by Captain W. Owen, seconded by the Secretary.

G. B. Tayler, Esq., Benares,—proposed by Mr. R. H. Hollingberry, seconded by Mr. Joseph Agabeg.

E. H. O'Brien, Esq., Calcutta,—proposed by Mr. C. A. Cantor, seconded by Mr. W. G. Rose.

Baboo Sonatun Bysack, Calcutta,—proposed by Baboo Peary Chand Mittra, seconded by Baboo Shibchunder Deb.

The following contributions were announced :—

1. General Report on the Administration of the several Presidencies and Provinces of British India during 1856-57, with Maps. Parts I. to III. Presented by the Government of Bengal.

2. A few plants from Rangoon, yielding an elastic gum. Presented by Captain E. H. Power.

These have, unfortunately, reached in a very sickly state.

3. A few excellent specimens of yellow and white maize, from American stock, and an aerial tuber of "New Zealand yam," presented by Mr. C. Sharpe, of the Barrackpore Park.

The following is an extract of Mr. Sharpe's letter on the above specimens :—

"I send a tuber, the produce from a small tuber (a little bigger than a hen's egg), which I received from the late Mr. Piddington in March last, and he stated it to be a New Zealand yam. I planted this small tuber in April last; it made very little growth till the rains set in; in July it was growing very fast. I then had large bamboo branches put up to keep the runners off the ground. In August I was rather surprised to see tubers forming on the runners. This I now send is, I think, the largest of about 10 fallen from the plant—20 more tubers are on the plant, of different sizes, and many more small tubers like peas appearing. Until I saw the tubers growing on the runners 6 to 8 feet from the ground, I was only thinking about a crop of tubers at the roots. I have also put up 20 cones of American corn seed from your American seeds of 1857—sown here in December and reaped in March 1858—sown again in June, and this is part of the produce. I will sow this year's seeds in the same routine."

4. A sample of raw silk of a superior quality, from the tussur worm of the Punjaub. Presented by H. Cope, Esq.

The following is Mr. Cope's note on the subject :—

"I am very glad to hear that the tussur is so much approved of. I do not think, after a very careful comparison with Mr. Frith's description of the *Saturnia* and all he says about that beautiful moth, that there is the slightest difference between the insect of Bengal and of the Punjaub. But the worms feed up here on the common 'ber,' and not on the 'asun,' as with you. Lord Wm. Hay has been so good as to send me several seers, and I will have them wound here, and send you large samples. The worm is found both in the plains near the hills, and on the lower hills wherever the 'ber' tree thrives; but not in sufficient quantities to make them an object of commerce, until they shall be cared for in the same way as in Bengal, as the numerous enemies they have greatly diminish their number."

5. A specimen of a hard and fine-grained wood from the Sonthal district. Presented by E. Johnson, Esq., of Narcoolbarea ; accompanied by the following communication :—

“ Having observed amongst the *Proceedings of the Society* a premium offered to the discoverer of any wood indigenous in India, and procurable in sufficient quantity, which shall serve as an efficient substitute for Turkish box, especially for wood-engraving, I beg to send herewith a specimen of wood, which I believe to be such as is required. It is called by the Sonthals ‘*parpurool*,’ and by the other natives in the district ‘*parpuree*.’ It bears a large leaf, two or three of which joined together form a dish for rice, &c., used by the Sonthals—the fruit is also eaten by this race. The wood is brought from ‘*Cheetowleea Hill*,’ 5 to 6 miles south-west of ‘*Byreoo Thannah*,’ which is 16 to 18 miles to the west of Rajmahal, in the Sonthal district.

“ A fair, called ‘*Bahlahsundee Hât*,’ about 6 to 8 miles north-west of Rajmahal, is held every four days, to which the Sonthals bring large quantities of different sorts of wood for sale, and say that they can bring the ‘*parpurool*’ always, if ordered one hât previously.

“ The man I sent to explore counted some 4 or 5 ‘*parpurool*’ trees within 3 to 4 miles, following the small hill paths ; but the Sonthals, who accompanied him, said that in the jungle (where they only can penetrate) they can procure a large quantity if required. The circumference of the sample now sent is 16 inches ; and two of the trees seen by my man were 40 inches in circumference according to the measure he brought, and which I quite believe to be correct. The other two to three trees seen by him were about the same size as the sample now sent.

“ The Sonthals make combs for the hair from this wood.

“ With the sample I have sent two specimens turned from a piece cut off one end for the purpose, and which will show the close grain of the wood—it appears also to be very hard.”

Mr. Johnson has promised to send specimens of the flower and fruit of the tree yielding this fine wood during the next hot season.

Nursery Garden.

The Gardeners’ monthly report was read, of which the following are extracts :—

“ In continuation of the last monthly report, I beg to state that I received a glazed case of plants, *viz.*, India rubber plants, from Captain Power of Rangoon. There were five plants, or rather five branches, which had slightly taken root, before being placed in the case; but as the whole were placed in a compost consisting principally of house rubbish, the whole dried up very speedily, and for want of moisture the plants suffered very much ; however, on

its receipt I immediately made cuttings of all, but I fear I shall not be successful with them.

"In September last I received two packets of seeds of 9 kinds, presented by Captain Lowther of Assam. The whole were laid out in the usual way : of the entire batch the following only germinated :—*Passiflora edulis*, very freely ; seeds of *Cissus-Sps.*, very freely ; and that of which Captain Lowther states to be a specific for ring-worms ; this plant is now too young to be traced out, but as soon as this is done, I shall not fail to communicate the same.

"The 39 kinds of trial vegetable seeds received from the Cape of Good Hope, from Mr. Upjohn, are really very good, and I consider both the collection and seeds to be far superior to that of Mr. Templeman, and much better than that of Messrs. Villet and Sons. The entire batch have freely germinated, excepting the two following kinds—the drumhead cabbage and sage, and the average percentage it yielded (67) is more satisfactory than the result shown in the other two, as will be perceived from the accompanying tabular statement. The whole of the seeds were also laid out in the open ground in the kitchen garden, a few days previous to the fall of the last heavy rains of the 25th ultimo, when they equally had freely germinated as in the trial sowing, but I regret to add that the whole had seriously suffered from the severe rains, in consequence of the places being overflowed by the rains. The specimen peas belonging to this batch were also laid out in open ground, but in somewhat elevated position ; such as had germinated before the rains have withstood all injury and are now doing well, those which were just developing have, unfortunately, been injured by being damped off. I may state that, much to my great surprise, I found the dwarf eclipse, and bishop's dwarf, imperial blue, and perfection peas to have freely germinated, and I expect their issue will be a satisfactory result. Had not the sad accident taken place so unexpectedly, I had every reason to hope the result would fully bear out the trial sowing. The specimen being a special one, I had carefully attended to its trial sowing, and must say that the batch far exceeds in selection and quality the others I have received during the present season ; but, I think, to establish such an opinion finally, it would be necessary to get seeds for two or three seasons more before such a decided opinion can be given, as I consider that this batch might have had some especial care and attention to its packing and despatch.

"The 12 new varieties of vegetable seeds received from Messrs. Gibbs and Co., and sent for special trial, had met my usual attention ; but I regret to state that, though I made two special sowings of the whole, they have somewhat singularly failed to germinate—even the *Sorghum saccharatum*, which is indigenous to this country ; whereas the seeds of the latter cereal, presented by General Sir John Hearsey, have not only freely

germinated, but have now grown upwards of 14 feet high, and are full of grain.

"The English flower seeds for the present season, from Messrs. J. Carter and Co. of London, are equally as good as that of the past year; though some are a little different, yet others exceed the average percentage sowing of the past year; consequently the whole may be said to be equally good. The accompanying tabular statement will show the result of the whole, which I consider to be very satisfactory.

"The Virginia tobacco seeds, presented by Mr. W. G. Rose, was laid out in gunlows, and in open ground. The seeds in gunlows have not yet germinated satisfactorily, but those in the open ground have yielded a better result, though the same had slightly sustained some injury from the last heavy fall of rains, as the seeds were sown a few days previous to the rains. The Kareen tobacco seeds, received from Dr. Thomson of the Botanical Gardens, presented by Captain Houghton, as the seeds collected from the Kareen Country, during the last year, was likewise laid out in open ground and at the same time, and I am happy to find the result to be very satisfactory.

"The general work done in the garden in the re-arrangement of all plants in the conservatory, dressing up the flower garden and securing every available spot to lay out seeds of annual flowers, and also in laying out the Kitchen Garden, each had a share of due attention, and the work was progressing satisfactorily as time and circumstance would admit; but, unfortunately, the disaster caused by the late gale, and the heavy fall of rain for a consecutive period of 36 hours and upwards, have tended to overthrow all the work previously done. Of the destruction and other damages caused by this disaster I beg to submit a statement in the accompanying memo.

"The cotton plants in the three plots have attained a very healthy growth during the past season. Many plants have attained to an extraordinary height, and formed complete bushes. I have much pleasure in submitting a rough statement of the produce of the plants of the three plots for the past season.

"In conclusion I beg to state that I have added to the ready stock, from the present year's produce, a large number of grafts of mangoes, peaches, litches, rose and star apple, pomegranates, spondias and a few cherries, and about a dozen cuttings of raspberry, fifty cuttings of gooseberry, and two hundred suckers of strawberry plants. All are available to members and non-members, at the usual rate of charges.

"In the Flower Garden a large collection of all kinds of roses, and a few of the Mauritius roses; forty-two fine healthy plants of *Amherstia nobilis*, seventy-two fine healthy plants of mahogany, from two years and upwards, and some of the satin-wood tree of the same age; a few *Fraxinus*, or

Chinese wax-yielding plant, and a variety of useful and ornamental plants are ready for distribution.

"The *Ceratonia siliqua*, or the carob trees, have this year, for the first time, come into bloom, which they have done profusely; but have not swelled into fruit as yet in any one of the spikes. The Nepal pear trees have likewise bloomed for the first time, and the *Daphne*, named after Mr. Fortune, presented by that gentleman in 1854, has now bloomed; the flowers of the same are exceedingly beautiful."

In connection with the above, the Secretary submitted statements of trial sowings made by Mr. Sharpe at the Barrackpore Park, of the Society's annual consignments of American and Cape vegetable, showing a general average percentage of 58 of the former and of 45 of the latter. Mr. Sharpe remarks:—"My opinion of the seeds is that they are very good. Some have failed altogether in my trials: light seeds that do not germinate quickly are apt to be carried off by ants, and other mishaps may occur."

Communications on various subjects.

The following papers were also submitted:—

1. From Dr. Campbell, Superintendent of Darjeeling, enclosing extract from his Report to the Board of Revenue regarding the progress of tea cultivation at Darjeeling. (Referred to the Committee of Papers.)

2. From H. G. Keene, Esq., in continuation of a previous notice about some of the vegetable productions of the Deyrah valley:—

"In reference to your inquiries about the coffee," writes Mr. Keene, "I beg to state, for the information of the Society, that I am now engaged in the publication of a pamphlet on the Doon as a scene of English colonization, which will go somewhat elaborately into the agricultural capabilities of the district; and will, I trust, form a useful manual on the subject. In the meanwhile I may observe that the coffee, of which I sent you a specimen (which answered so badly owing to bad packing), was grown by Lalla Mohur Singh, my treasurer, from seed given to him by Mr. Vansittart about A. D. 1845: other landholders received seed at the same time, but did not take the trouble to sow it, and Mohur Singh's labors ended with that operation. The coffee, sown in the untidy garden so universally met with in these Provinces, grew untended, but in one respect benefited; I mean that the damp and shade of the surrounding plantains and mangoes have favored its growth. He is now propagating it by slips, and promises to turn his attention to the subject in earnest.

"The other valuable produce of the Doon is tea, which yields as much as 300 lbs. of manufactured tea per acre. It has to be shaded by straw blinds and freely sprinkled with water during the hot weather, and the seedlings are planted out when about nine months old."

"It is believed that Indigo would grow to a profit. Cereals are decidedly unsuccessful. A peculiarity of this valley is that there is no frost (in most parts) in winter, and but little hot wind in summer. These remarks apply least to the open ground of the Western Doon, and most to the sheltered neighborhood of Deyrah.

"When my pamphlet appears, you will find little else required, I hope, for practical purposes. The cassia is from the Hill Pergunnah of Jouniar Bawur, which is rich in ginger, chillies, turmeric, walnuts, potatoes, opium, wax and honey."

3. From Lieutenant J. F. Pogson, in reference to the proposed establishment of agricultural schools:—

"I am glad to see there is some chance of establishing agricultural schools—when this is done education will prosper. The system I would recommend would be lectures in the Vernacular, given at large villages, and all the interesting experiments contained in *Johnstone's Catechism of Agricultural Chemistry and Geology* being shown to the audience. The native of India is as curious as he is superstitious, and the only way to educate him is to arouse his curiosity.

"The chemical experiments contained in the work alluded to are sure to do this, and when oral education has made some impression on them, it would then be time enough to begin with reading and writing. The latter to be simply the written names of fruits, vegetables and cereals, which the student should be able to read: this much knowledge acquired, other books should be placed within his reach. If any of the Calcutta book-sellers have the work in question, I would respectfully beg all who take an interest in native education to obtain and peruse it."

4. From H. Cope, Esq., the following remarks in reference to the Cape thatching grass:—

"I see by the record of the Proceedings of the Society at their last meeting, that Dr. A. Gibson informs you he does not possess the Cape thatching grass (*RESTIO tectorum*.) I must, in justification of my former letter on this subject, request you to turn, if you have it, to *Graham's Catalogue of Bombay Plants*, where you will find it stated, at page 231, on the authority of Dr. Lush, who was, I believe, Dr. Gibson's predecessor in the superintendence of the Dapooree garden, that the *R. tectorum* was introduced into that garden from the Cape of Good Hope; and it was this assertion that induced me to draw your attention to the matter. Dr. Voigt (*Hort. Suburbanus Calc.*, p. 730,) has curiously mis-quoted the passage in *Graham's Book*. Dr. Lush says:—'Introduced in Dapooree from the C. G. H., where it is much used for thatching houses.' Dr. Voigt makes him say:—'Introduced in Dapooree, where it is much used in thatching houses.'"

5. From P. Cosserat, Esq., of Ghuzeeppore, regarding his sowings of vegetable seeds this season :—

“ Both the American and Cape seeds have germinated splendidly : no failures, and all but Cape parsnip a good average. American parsnip has never failed me whenever I have had it to sow, and in Shahabad I have raised as fine roots as I have seen in England, and fine flavor.”

6. From Lieutenant R. Stewart, Superintendent of Cachar, dated 6th October, acknowledging receipt of a large supply of seeds sent by the Society for distribution :—

“ I have within the last week,” writes Mr. Stewart, “ received the different seeds you so kindly sent me, and I can assure you their distribution has been a great success. The people in this part of the country, in consequence of the failure last year, of their staple—rice—have become in a measure convinced of the benefits arising from a greater variety of cultivation ; and I had not advertised for two days that I had seed to distribute, before my verandah was crowded with applicants. To each of these, having due reference to their places of residence, so as to scatter the seed as much as possible over the whole country, I gave about half a pound of wheat and oats, and a proper portion of the other things. I desired them to report to me of the success or otherwise of the experiment they were going to make, and cautioned them not to consume any of the crop, but to keep it for next year’s seed. I shall be able to make a further report to you by-and-bye, as I shall see many of the places sown with this seed during my cold weather circuit, and, with the experience I shall then have, I will write to you for a further supply for next year.”

7. From Major W. H. Hopkins, commanding at Darjeeling, returning thanks for seeds supplied for soldiers’ garden at that station.

8. From C. E. Chapman, Esq., Magistrate of Dinagepore, conveying his thanks for seeds supplied for the use of the Naval Brigade at that Station.

9. From Dr. J. P. Walker, Superintendent of Port Blair, Andamans, acknowledging receipt of a large box of seeds forwarded to him :—“ The seeds arrived in excellent order. I beg that you will express my thanks to the Society for its kind attention, which is duly appreciated.”

10. From Lieutenant T. G. Ross, Officiating Honorary Secretary Mela Committee, Cachar, enclosing a list of prizes offered at the Cachar Mela, and requesting the co-operation of the Society.

The Council propose that the Society continue forwarding seeds for distribution, but they are not prepared to recommend a money grant.

11. From R. Fortune, Esq., Shanghai, dated 25th August, intimating that he will have great pleasure in complying with the wish of the Society for seeds and plants from China.

Letters were also submitted from the Superintendent of the P. and O. Company, Messrs. Jardine, Skinner and Co., Apcar and Co., and Gladstone, Wylie and Co., expressive of their readiness to have cases of plants and boxes of seeds from Mr. Fortune forwarded free of freight. Messrs. Gladstone, Wylie and Co. add,—“ We may further mention that we shall always be happy to forward the views of the Society in any way they may point out.”

For all the above communications and presentations the best thanks of the Society were accorded.

The ordinary business having terminated, the meeting was made *special*, as notified a month previously, “ for the purpose of considering the propriety or otherwise of continuing the Society’s official connection with the Agricultural and Horticultural department of *The Indian Field*.”

The Secretary, by desire of the President, read the following Resolution, adopted at a meeting of the Council, held on the 9th October 1858 :—

“ The Council, having had under their consideration the connection of the Agricultural and Horticultural Society with *The Indian Field*, are of opinion that it is undesirable that their name should continue officially connected with any publication not entirely under their control, however distinct the different departments may be kept, and however unobjectionable the Society’s part may hitherto have been found ; and therefore *resolve* that the Society be recommended to discontinue the connection.”

Mr. Hume addressed the meeting against the above recommendation.

The President read the following letter to his address from Mr. James Forlong of Kishnagur :—

“ *Neechindipore, November 4, 1858.*

“ TO SIR ARTHUR BULLER,

“ *President of the Agri.-Horticultural Society, Calcutta.*

“ DEAR SIR,—I am very sorry it will not be in my power to attend the meeting of the Society specially convened for the 10th instant.

“ I regret this the more because the subjects to be brought before the meeting have arisen from matters supposed to relate solely to the indigo planting interest, and such being the case, it would only be respectful to you and to the members of the Society generally, that as many planters should attend the meeting as possible.

“ I suppose the questions to be brought under the consideration of the meeting will be confined to two :—

“ *First*.—The correspondence between Mr. McArthur and the Secretary.

“ *Second*.—The disconnection of the Society from *The Indian Field* as its organ.

"As to the first, I hope it will involve little discussion, for in this large indigo district I have not heard one dissentient voice, as to the tone of Mr. McArthur's letters to the Secretary having been uncalled for, and most unnecessarily uncourteous.

"The second subject will, I fear, find the meeting equally unanimous, and my only cause of fear is that, by the course which has been adopted, it will give the parties editing the *Field* some little show of reason for stating that the hostility of the planters had arisen from an honest and independent expression of opinion adverse to them as a body, and almost look like an attempt to interfere with the press; now I can only say, for many other planters as well as myself, that this is far from our feeling regarding *The Indian Field*: we think the articles in the *Field* relating to indigo planting carried with them their own antidote from the strong party animus they displayed, and it seems to us only a pity that a degree of importance should have been attached to them, which they were very far from meriting, by the mode in which some members of our Society have acted; I feel assured that, a quiet and temperate representation to yourself and the Council of the Society, on the part of one or two members, would have obtained all that the meeting proposed for the 10th is likely to accomplish, and that also in a much more dignified form.

"I think at the same time that *The Indian Field* is by no means entitled to be the organ of the Society—simply from the strong Anti-English spirit which it almost invariably displays, and which, without the slightest reference to indigo planting, would assuredly ere long lead even the most moderate members of our Society to exclaim against the Society being represented by such a paper; for this reason alone I record my vote against the *Field* being looked upon further as the organ of the Society, or indeed any other paper at the Presidency: it is idle to expect that any Paper would give general satisfaction, and after the experiment that has been made with the *Field*, it would be unwise to make another of a similar nature.

"In the case of the *Field* every consideration, both public and private, might have dictated to the Editor a spirit of fairness, and have guided his pen impartially in all matters between the European and Native; whereas to the former, particularly unconnected with the services, every opportunity has been seized to exaggerate failings, and in the latter case, to over-estimate virtues, making the paper a vehicle for indulging the prejudiced feeling of the few, in place of what it so easily might have been—a paper not only respected by all moderate men, but useful in healing discord between races in place of creating further irritation; it is this policy alone which has unfitted the paper to be any longer the organ of our Society, and I strongly protest, in the name of many of my brother planters and my own, against our

being thought to be actuated by any other feeling in wishing the connection of the Society with the *Field* to terminate.

“ For planters to combine against any paper for articles merely unfriendly to their own interests, would, indeed, be a silly and undignified exercise of displeasure, and which might well warrant the resentment of the whole press at such interference with its freedom. . .

“ I have noticed, with much regret, the attempts that have been made to prejudice members against our Secretary, whose services have been so valuable, and who, in place of censure, well merits the warmest thanks of every member of our Society ; it is not often that the Secretary is more necessary to his office than the office to him, but it would appear to others and to myself that this is fortunately the case with Mr. Blechynden.

“ I would not have addressed you at such length, did I not feel that it was only just to much the largest portion of the Indigo planters to place their opinions before you prior to the meeting on the 10th, when so few of them, just at this busy time of the season, can be absent from their factories.

“ I have the honor to be,

“ Dear sir,

“ Your most obedient servant,

“ (Signed) JAMES FORLONG.

“ 4th November 1858.”

The President addressed the meeting at some length in support of the recommendation of the Council.

The meeting then divided: when there appeared

In favor of the recommendation	...	...	...	24
Proxies	...	...	...	10
				—34
Against the recommendation	...	...	...	34
Proxies	...	...	...	13
				—47
				—
Majority against	...	...	...	13
				—

The recommendation was accordingly lost.

Since the above meeting was held, a letter has been received from the Board of Management of the Calcutta Printing and Publishing Company, terminating the connection between the Society and *The Indian Field*.

THE JOURNAL
OF THE
Agricultural & Horticultural Society
OF
INDIA.

*The Date Tree; a Prize Essay on its cultivation and the
manufacture of its Juice into Sugar: By S. H. ROBINSON, ESQ.*

(Premium of Five Hundred Rupees.)

SECTION I.

Description of the Tree.

The Palm tribe, to which belongs the subject of this Essay, has been described by the eminent Botanist Lindley as "the most interesting race of plants in the vegetable kingdom, whether we consider the majestic aspect of their towering stems, crowned by a still more gigantic foliage, the character of grandeur which they impress upon the landscape of the countries they inhabit; or their immense value to mankind, as affording food and raiment, and numerous objects of economical importance."

The above remarks are eminently applicable to that portion of the family indigenous to Asia;—and the importance of our Indian varieties could not fail to attract the attention of botanists. The late Dr. Griffith, Superintendent of the Calcutta Botanical Garden, had progressed in a description of the "Palms of India," which has been published since his death, and, though imperfect, is a valuable contribution.

The Date Tree ;

to our knowledge of the subject. He enumerates 18 genera and about 240 species, with illustrations of many of them, and descriptions of many little known and interesting varieties. From this work, and that of his talented predecessor Dr. Roxburgh, may be obtained a fair estimate of the importance and value of our Indian species, and of their useful products. Amongst the principal of these may be reckoned fibre, sugar, oil and sago,—the investigation of each of which would call for a separate Essay ;—but it is evident from what we do know, that the economical uses of our palms are as yet but very imperfectly developed, and are well deserving of further investigation.

It is certain that several varieties yield a valuable sugar besides the Date Palm. It has been made to some extent in Ceylon from *Borassus flabelliformis*, or the Fan palm,—the sap of which is generally used as a ferment by the bread-makers of Bengal ;—and from *Cocos nucifera*, or the Cocoa palm,—to a considerable extent also in Ceylon :—also from *Arenca saccharifera*, an important Manilla palm, which was introduced into Bengal by Dr. Roxburgh,—and from *Caryota urens* common on the Malabar coast, as also in Dinagepore and Assam. At Malabar it yields an extraordinary quantity of sap,—as much as 100 pints in the twenty-four hours in the hot season, as reported to Roxburgh.* It cannot be doubted that many other varieties are sacchariferous, and the two last named certainly merit the attention of the Bengal planter.

Phoenix, the genus to which the Date Palm belongs, comprises nine known species, of which 6 are indigenous in India, and are distinguished as : 1, *acaulis* ; 2, *Ouseleyana* ; 3, *pedunculata* ; 4, *farinifera* ; 5, *sylvestris* or *dactylifera* ; 6, *paludosa*. Of these, No. 4 produces sago of an inferior quality ;—and from all the species the leaves furnish

* Both these last named varieties are still flourishing in the Calcutta Botanical Gardens.

materials for mats or thatch for houses. The sugar yielding variety, *Phœnix sylvestris*, is known as the wild date of Bengal: *Phœnix dactylifera* is the name given to the true Date Palm of Arabia and Africa, but as it appears to be undistinguishable from the Bengal variety, except in size and vigor of growth, there seems little doubt that any apparent difference is due only to superior cultivation and variety of climate or soil; and it being always a cultivated tree in Bengal, the specific name *sylvestris* may have been originally given, owing to its inferiority in size to the African or Arabian tree, with which European botanists were more early familiar.

The Date Palm, when not stunted in its growth by extraction of its juice for sugar, is a very handsome tree, rising in Bengal from 30 to 40 feet in height, with a dense crown of leaves, spreading in a hemispherical form from its summit: these leaves are from 10 to 15 feet long, and composed of numerous leaflets or pinnules about 18 inches long. The trunk is rough, from the adherence of the bases of the falling leaves, which serves to distinguish it at a glance from the smooth-trunked cocoanut palm, which in its leaves only it resembles. Like all of the *Phœnix* genus the trees are diœcious; and the fruit hangs in dense bunches from the centre of the crown of the female tree: it flowers about April or May, and the fruit ripens in July or August; the latter is however of a very inferior description in Bengal, and is seldom gathered except for its seed, from which the young trees are raised. The fruit indeed consists more of seed than of pulp, and altogether is only about one-fourth the size of the Arabian kind brought annually to Calcutta for sale, and when fresh imported, a rich and favorite fruit there. This inferiority of the Bengal fruit may no doubt be attributed to the entire neglect of its improvement there from time immemorial, and perhaps in some measure to the practise of tapping the trees for their sap, so universally,

followed in the districts around Calcutta, its principal range of growth.

SECTION II.

Geography and Statistics.

The Date tree is met with in almost every part of Bengal Proper, but it flourishes most congenially, and is found plentifully, only in the alluvial soils which cover its south-eastern portion, excepting only such tracts as suffer entire submersion annually from the overflow of their rivers, as is common in portions of the Dacca, Mymensing, and Sunderbund districts. The extent of country best suited for its growth, and over which it is found most plentifully as above indicated, may therefore be taken as within an area stretching east and west about 200 miles, and north and south about 100 miles, and comprehending by a rough estimate about 9,000 square miles,—within an irregular triangular space.

The practise of extracting its juice, however, for the production of sugar, extends at present over a much smaller area, probably not more than two-thirds of the above described space; and if we consider further, how small a portion of these favorite date districts even are as yet occupied by date tree cultivation, the room for its future extension, even if confined to these tracts alone, appears a wide one indeed. If we trace an irregular parallelogram, stretching eastward from Kishengunge in the Nuddea district to Backergunge, and from Mahduppore in Furreedpore district southward to the borders of the Sunderbunds, we shall find a space of about 100 miles long by 80 broad, and comprehending the district of Jessore, with portions of Furreedpore, Nuddea, and Burrisaul, to which the product of Date sugar is mainly confined, although the goor,—or the first raw produce made by boiling down the juice,—is found commonly

manufactured for native consumption on the spot, in many localities situated beyond these assumed limits.

Throughout the present Date tract the quantity and quality of the sugar produced vary considerably. The high and dry lands of parts of Kishnaghur and Pubna yield a strong well crystallized product, though less in quantity than from trees of the Jessore and Sunderbunds soils; in which, with a more rapid growth of the tree, a greater flow of sap, and a less rich, though still good and grainy sugar, is produced. The cultivation in these districts is accompanied by a great advantage, in the cheap and abundant supply of fuel for boiling the juice and refining the sugar; and there is probably no part of Bengal where the cultivation may be extended with more profit than in the more elevated lands of the Sunderbund grants.

The production of the date tree sugar—that is, of the dry merchantable product as distinguished from the raw inspissated juice or goor,—has greatly increased in Bengal during the last twenty years, though not to the extent that it would doubtlessly have done, had it not been checked by the violent fluctuations in its value, which will be referred to presently. The following brief sketch of its progress is necessarily imperfect from the great want of reliable statistics on which to frame it. It is certain that previous to the first inroads on the East India Company's trade monopoly in 1813, it was hardly known as an article of export, but was manufactured only to meet the wants of native consumers in and around the few places of its production, principally in Jessore and Furreedpore districts, and for occasional transport to the principal marts of the adjacent districts, and especially to Moorshedabad and Dacca in the days of their prosperity, when, previous to the British rule, they were the centres of the trade and wealth of Lower Bengal. In 1792, it is recorded in an old minute of the Government Board of Trade at Calcutta, that the total

production of, date sugar in Bengal was then estimated at 15,000 maunds of 82lbs each. From 1792 up to 1813—a period of 31 years—the quantity of all sugars imported into Great Britain from the East Indies is found to range from 1,000 to about 6,000 tons per annum, excepting only the year 1801, in which it reached 11,327 tons. In those days all East India sugar was received from Bengal only, excepting an occasional small shipment from Madras.

The modification of the East India Company's trade monopoly in 1813, brought private traders into the field, and we accordingly find the imports of East India sugar into Great Britain gradually ascending from 6,282 tons in 1816 to 13,453 tons in 1822. Throughout this period however, and onward to 1837, all sugars from India were loaded with an additional duty of 10 shillings per cwt., beyond the rate charged on West India sugars; and this appears to have acted as an effective check to the increase of the trade to Great Britain, as the quantity subsequently fell off, and the total Bengal exports thereto from 1830 to 1836 averaged rather below 6,000 tons per annum. This is further shewn by comparing the exports to Great Britain as above with those to other countries, from which it is seen that the former still formed by no means the principal portion of the total quantity exported. North America, the Arabian and Persian Gulphs, and Foreign Europe, figure in the returns as taking off one-third to one-half of the total exports.

We have of course no data to show what proportion of the total exports consisted of date sugars, but the review of these figures affords sufficient evidence of how little encouragement the production of East India sugar generally received for supplying the export trade, and that in fact there was little inducement to extend it beyond meeting the wants of an increasing native population, with whom it has always been a favorite luxury. This increase however, there is little doubt, was most apparent in the sugar from the date tree;

its comparative cheapness, combined with good quality, being sufficient to stimulate its production as an article of domestic consumption in and around the date districts, in preference to the more expensive and precarious cultivation of the sugar-cane. The writer of this treatise first visited the date sugar markets in 1833, and the estimates then made shewed that the production of all qualities was equal to 90,000 maunds of dry sugar. Prices during that and the four following years ranged very low, and it is probable that the year 1837 found the crop of dry date sugar, though a fair average one, hardly exceeding 100,000 maunds.

We now come to a period of great advancement. From 1837 the British legislature decreed the equalization of duties on sugars imported into Great Britain from the East and from the West Indies. The effects of this act of tardy justice on the sugar trade with Bengal were immediate. During the succeeding five years the exports from Calcutta to Great Britain gradually swelled from 13,403 tons in 1836-37 to 63,084 tons in 1840-41. The trade then became a steady one, and onwards to 1847-48—that is, for a period of 8 years—the average of these exports was close upon 60,000 tons per annum.

Here again it must be remarked that there are no reliable data by which to calculate with any certainty what portion of these exports was composed of date produce. Inferential estimates, aided by notes taken by the writer from time to time during this period, shew that in 1848 the total date sugar crop was about 15,000 tons, or 405,000 maunds, of which two-thirds, or 10,000 tons, may have been merged in the exports from Calcutta, the remainder passing away in local native consumption. From this it would appear that the production had more than quadrupled in ten years, and this is probably not far from the truth. Throughout these years high prices were ruling in the British markets, and in Calcutta.

The West-Indies were struggling through their revolution of slave emancipation, and their diminished production of sugar had to be balanced by drawing on the produce of India and Mauritius, to supply the home demand for consumption, which remained nearly stationary, notwithstanding the progressive increase of population ; though there is no doubt the consumption would have increased in the like proportion, but for the high prices at which the article was maintained.

The average price of all sugars in Calcutta for the three years, 1846 to 1848, was 9 Rupees 12 annas per maund. The bulk of this was cane sugar from the Benares and adjacent districts, but date sugars fully participated in the high rates, and began to form, as above shown, an important part of the exports. Prices ranging from 5 to 7 Rupees per maund were usually current during this period for good date and *gurpatta* sugars, being fully fifty per cent. higher than what have been proved during subsequent years to afford good and remunerative returns to the producers.

Throughout the decade then above reviewed, 1837-38 to 1847-48, every encouragement for the increase of date tree cultivation was in operation. Steady demand, high prices, and a near and ready market at Calcutta were experienced ; and in addition to these, the demands of the European sugar refiners helped materially to encourage the production of the inferior descriptions. The first European refinery in Bengal was established in 1829 in the Burdwan district, but owing to the differential duties on sugars exported to Great Britain, its operations were restricted to very narrow limits until 1837-38. Encouraged by the equalization of the duties, competitors then appeared, principally in the vicinity of Calcutta. Their proprietors were not slow to discover the good qualities of date sugar as raw material for refining, they drew largely from the Jéssore and Furreedpore markets ; and, supported as they were by English

capital, they contributed in no small degree to stimulate the cultivation.

Apt and ready as the Natives of Bengal are known to be, to follow up any branch of industry affording such profitable returns, it might well have been expected that the increase of date tree produce under the very encouraging circumstances, acting over a course of years, as detailed above, would have proved much larger by the year 1848 than this estimate has made it. Undoubtedly during those years, and more especially in the later portion of them, the setting out of new plantations throughout the date districts was very large ; but it must be remembered that the tree is of slow growth, that for the first five years after planting no produce is obtained from it, and that it comes to full bearing only in its eighth year of growth. This will be sufficient to account for the increase up to 1848 being so much less than it has been under less favorable circumstances, and under lower prices, during subsequent years, when the trees planted during such prosperity came successively to fruition.

We have next to consider the first great check experienced by the cultivators. The principles of free trade were rapidly gaining ascendancy in Great Britain, and in 1846 the Legislature enacted, in defiance of and contradiction to all its previous tendencies for half a century, that in the article of sugar only, slave labor and the slave trade should be encouraged, and that, by a scale of duties gradually assimilating, the sugar produce of all the world, by the end of seven years from that time, should be admitted to British consumption on equal terms. The first effects of this measure were the English markets being inundated with supplies of foreign sugars, and towards the end of the following year 1847, a panic there and throughout our sugar colonies. Ruin at last overtook many a West India proprietor, who had struggled so far against the difficulties of slave emancipation, whilst in Bengal all sugars fell in value to below the cost of

production, and large sums of British capital invested in sugar refineries there, were suddenly annihilated.

But the operation of the change had only commenced and was soon to be more fully developed. The notion was very prevalent that no sugar grown by free labour could compete in cheapness with that raised by slaves, and the stimulus now given to the production of slave-grown was greater than ever. Great Britain, as the largest sugar consuming country, became the focus of this increasing trade for all Europe. In the year 1851, it reached its culminating point, and a second glut and panic in that year were the result. In January and February, 1852, sugars in Calcutta, were next to unsaleable. The date crop would have been a large one but for this discouraging crisis of the trade during these, the best months for gathering it. But the poor date tree cultivator finding no immediate sale for his goor at a price that would cover the cost of collecting and boiling it, abandoned the trees, allowed the sap to run to waste, and turned his hand to more profitable agriculture.

The business of date tree cultivation being, with two or three isolated exceptions, entirely carried on by the impoverished ryot of Bengal, we cannot but conclude that during these two periods of depression at least, all planting of young trees was suspended, and all care of young plantations neglected, but it is probable these checks were much more lasting in their effects, and that the planting since 1848 has not continued in the same increasing ratio as before that year.

Still the production continued to increase, and the average annual produce in dry sugar, may now, 1857-58, be estimated at 35,000 tons, of which one-third disappears in native consumption in various forms in the date districts themselves, or those adjacent thereto, and the rest remains for export via Calcutta. Had the cultivation not received the checks just alluded to, there seems no doubt the produce would have

again quadrupled during the last eight years, as it did from 1838 to 1846.

To sum up the progress of the cultivation it appears that

in $\left. \begin{matrix} 1792 \\ 1813 \end{matrix} \right\}$ it averaged 550 tons or 15,000 mds.

in 1833 it was 3,300 tons or 90,000 mds.

in 1837 it was 3,700 tons or 100,000 mds.

in 1848 it was 15,000 tons or 405,000 mds.

in $\left. \begin{matrix} 1854 \\ 1858 \end{matrix} \right\}$ it averaged 35,000 tons or 953,750 mds.

So great and steady an increase in the cultivation notwithstanding partial checks, is sufficient evidence of its value as a remunerative branch of industry, and this is the more patent when we remember that the increase was the natural result of advantages derived from it by the small ryots of the date districts, and not due to any aid from the capitalist, European or Native, applied direct to the cultivation. On the contrary it is but too well known that the poor proprietors have suffered much discouragement from the proverbial rapacity of their landlords, the Bengal zemindars, who seeing the prosperity of their ryots consequent on the long run of high prices, seized every pretext to levy additional and novel taxes on the trees and their produce, and thus to appropriate to themselves a goodly share of the profits arising from the advance in the value.

SECTION III.

Native Method of Cultivation, and Sugar Manufacture.

It has been mentioned in a preceding page that the date tree is always cultivated in Bengal; so little care and labour are however bestowed on the trees after they are planted out by the native ryots, that the cultivation they receive is of a very limited character. The young plants are raised from seed sown during the rains, and are ready for planting out in the following April or May, after the first showers of the

season have moistened the ground sufficiently. Before the date sugars became important as a staple for export, and the cultivation extended, the trees were seldom seen planted elsewhere than along the hedge-rows or boundaries of the fields, or on other spots where they did not interfere with the growth of cereals or other field crops. Gradually as date produce became more valuable, systematic plantations appeared, and fields were set with trees 10 to 15 feet apart, but without much regard to order or regularity of distance. After planting no manuring or further expence was incurred, except perhaps in supplying fresh plants in place of those destroyed by cattle.

The spaces between the trees are generally occupied by oil-seed or other dry weather crops, and thus the cost of a Native plantation is reduced, whilst the trees benefit by the ploughing, which loosens the earth, and the ground is kept free from weeds.

The usual computation of the Native cultivator is that a beegah of ground should contain two puns of eighty each, or 160 trees. On a standard beegah of 14,400 square feet this would require the trees to be planted about 10 feet apart. The cost per beegah so planted to cover expenses of the first five years, during which no produce is obtained from the trees, may be reckoned as follows :

	R.	A.	P.
Cost of 160 young plants,	1	0	0
Planting,	1	0	0
Half* the rent at 2 Rs. per annum, .. .	1	0	0
Ploughing 4 ans., weeding 8 ans., in all Rs.1-12			
for 5 years, is,	8	12	0
	<hr/>		
Total Rs.	10	12	0

At the expiry of the fifth year from the planting of the young tree in the field, it is ready to be tapped for its juice. This

. * The other half being chargeable to the crop cultivated between the trees.

is the average time allowed, though it may be varied a year sooner or later by the difference of soil and climate. The first year a young tree is tapped, it is reckoned to yield only half the usual quantity of juice produced by a full grown tree; for the second year of tapping it is reckoned to yield three-fourths of full average quantity; and it is not till the third year of bearing that it is considered as in full yield.

The process of tapping and extracting the juice commences about the 1st of November. Some days previously the lower leaves of the crown are stripped off all round, and a few extra leaves from the side of the tree intended to be tapped: on the part thus denuded a triangular incision is made with a knife about an inch deep, so as to penetrate through the cortex, and divide the sap vessels; each side of the triangle measuring about 6 inches, with one point downwards, in which is inserted a piece of grooved bamboo, along which the sap trickles, and from thence drops into an earthen pot suspended underneath it by a string: the pots are suspended in the evening, and removed very early the following morning, ere the sun has sufficient power to warm the juice, which would cause it immediately to ferment, and destroy its quality of crystallizing into sugar.

A plantation is always divided by the cultivator into seven equal sections, and one such section is cut afresh daily. The cutting is made in the afternoon, and the pot suspended as above mentioned: next morning the pot is found to contain, from a full grown tree, 10 seers of juice, the second morning 4 seers, and the third morning 2 seers of juice; the quantity exuding afterwards is so small that no pot is suspended for the next four days. On the evening of the seventh day it again comes to the turn of this section of trees to be cut, which is effected by a thin slice being pared from the triangular face, which by again dividing the sap vessels causes the juice to flow afresh as at first. Each section is thus cut in succession, and the process is repeated

throughout the goor season, which usually terminates about the 15th February, after which the heat of the weather causes the juice to ferment so rapidly, that it is no more convertible into sugar, and consequently not worth the labour of extraction and evaporation of its water, as molasses only would be the product. Juice produced during the day-time of the cold season is of similar quality, and for the same reason is allowed to run to waste.

The ordinary date sugar crop season is therefore about three and a half months in duration, reckoning from 1st November to 15th February. A fall of rain however entirely stops the collection of the juice, and the heavy damp fogs to which the date districts are very subject, cause the juice to ferment, and render it comparatively valueless. From these causes one-fifth must be deducted from the whole period of the season for weather casualties to arrive at the total number of *effective* days for goor yielding, which will thus be found to be about 85 days. Assuming the whole period at three and a half months or 107 days, and dividing these into periods of 7 days for each interval for fresh cutting, we have 15 and $\frac{2}{7}$ ths as the average number of cuttings to each tree, and this multiplied by 16 seers, the quantity of juice yielded during the three days after each fresh cutting, and deducting $\frac{1}{5}$ th from the total result for casualties of weather as above, we arrive at the total produce in juice from each tree for the whole season, which is thus found to be bazar maunds 4-36-4.

If we now multiply the quantity of juice yielded by each tree for the season by 160, the usual number of trees reckoned to a beegah of ground, we have bazar maunds 787-20-13 as the total yield of juice from a beegah, and as ordinary juice yields $\frac{1}{10}$ th of its weight in goor, we thus find bazar maunds 78-30 as the produce in goor per beegah, being nearly 19 $\frac{3}{4}$ seers as the average produce of each tree for the season.

Let us now proceed to examine the mode of preparing the goor, or first raw product from the juice, and the cost of the process.

Daily at sun-rise throughout the goor season, the industrious ryot may be seen climbing his trees, and collecting at a convenient spot beneath them the earthen pots containing the juice yielded during the past night. Under a rude shed, covered with the leaves of the date tree itself, and erected under the shade of the plantation, is prepared the boiling apparatus to serve for the goor season. It consists of a hole of about three feet in diameter sunk about two feet in the ground, over which are supported by mud arches, four thin earthen pans of a semi-globular shape, and 18 inches in diameter, the hole itself is the furnace, and has two apertures on opposite sides for feeding in the fuel, and for escape of the smoke. The fire is lit as soon as the juice is collected, and poured into the four pans, which are kept constantly supplied with fresh juice as the water evaporates, until the whole produce of the morning is boiled down to the required density. As the contents of each pan become sufficiently boiled, they are ladled out into other earthen pots or jars, of various sizes, from 5 to 20 seers of contents, according to local custom, and in these the boiled extract cools, crystallizes into a hard compound of granulated sugar and molasses, and is brought to market for sale as *goor*.

The fuel mostly employed for the boiling process is the soondree wood (*Heritiera minor*) which forms the principal part of the wild tree vegetation of the Soonderbunds, and, from their contiguity to all the date districts, it is supplied as a cheap fuel to every part of them. The under-leaves stripped from the date trees form a part of the fuel used also. Next to the cost of labor in the process, the cost of the fuel is the most expensive item in the production of the goor by the native method. It is reckoned that for boiling the juice throughout the season from one beegah of ground or 160 trees, 400

maunds of sondry wood are required, in addition to the dried date tree leaves, which at 5 Rs. per 100 mds., which is probably an average rate in and near the Soonderbunds, gives 20 Rs. per beegah.

In estimating the cost of the goor an annual charge must be included in the calculation for the expenses of the plantation. It was shewn at page 254 that the aggregate cost to the ryot for the first five years was Rs. 10-12; but as no further ploughing and weeding are given after the trees commence yielding, which they do from that time throughout an average period of 20 years, we may assume one rupee per beegah per annum as an ample representation to the ryot for the actual labor of cultivation.

One half of the annual *rent*, or one rupee per beegah, should also continue to be included in the estimate.

The labor of collecting and boiling the juice is however the largest item in the list. The ryots are accustomed to reckon one headman at 4 Rs. per month wages, and two tree climbers at 3 Rs. per month each, are required for 200 trees, and these for a season of $3\frac{1}{2}$ months will cost 35 Rs. By the same rule the proportion for a beegah of 160 trees would be 28 Rs.

The total cost of the produce of a beegah may be summed up as follows:—

Annual proportion of expence of cultivating,	Rs.	1	0	0
Annual half rent of ground,	1	0	0	
Labour, cutting trees, collecting, and boiling, ..	28	0	0	
Cost of fuel,	20	0	0	
Earthen pots, pans, tools, &c., &c.	10	4	0	

Total, Rs. 60 4 0

The charcoal from the fuel used is calculated

to yield, 1 0 0

Leaving Rs. 59 4 0

as the nett cost of 78 $\frac{3}{4}$ maunds of goor, the produce of a beegah as shewn at page 256, or, as nearly as can be reckoned, 12 annas per bazar maund as the actual cost to the ryot, leaving him a bare return for his labour expended on it.

That the above is an approximate estimate of the actual cost of production was exemplified in the season of 1851-52, so disastrous to the date sugar produce, as adverted to at page 252. In that season the ryot continued to manufacture the goor and bring it to the village markets for sale until the price gradually fell to 12 annas per maund. When this rate could no longer be procured, the trees were abandoned for the remainder of the season.

SECTION IV.

The Native Date Sugars, and the modes of their Manufacture from Goor.

The estimates of annual production and exports of date sugars given in Section II, referred only to such descriptions of the produce as had been cured or refined, and must be distinguished from the *goor*, or first product from the tree, as prepared by the cultivators by boiling and evaporating the water present in the sap. The subsequent processes by which the goor is deprived more or less of its molasses and impurities, and the drier and more merchantable kinds of sugar are prepared for market, will now be briefly described. These processes are always conducted by a distinct class of operators, who purchase the goor from the cultivators, and bring it to various stages of purity and dryness under different denominations.

1st. *Khaur* is made by filling the goor into coarse sacks or gunny bags, and pressing them between bamboos lashed together, or beneath heavy weights, until 30 to 40 per cent. of the entire weight is forced out in the shape of molasses. The residue is then mixed, packed in clean bags, and is ready for sale.

2nd. Fine Khaur or Nimphool is made by repeating the above process for making khaur ; the only difference being that the khaur is sprinkled and mixed with water before subjecting it to the second packing and pressure. This causes a further portion of the molasses to be washed and separated from the mass, and the product is lighter colored and finer than the khaur, and about 50 per cent. only of the original weight of goor remains. A third application of the same process is sometimes resorted to, which carries away another 5 per cent. of the original weight, and leaves a residue still drier and lighter colored than the ordinary nimphool.

In all nimphool and khaur sugars, however, a certain portion of water or moisture remains, it being never subjected to any sun-drying or other process for evaporating the water, and this renders it liable to deliquesce and sweating through the bags in which it is usually packed. This is especially the case in damp weather, and loss of color and acidity follow in a few weeks.

3rd. Dullooah, or Doloo, is made by filling the goor into round baskets or conical earthen vessels holding two to three maunds each. The baskets being of an open fabric, and the cones made with a hole at the apex, the molasses drains from the goor into a vessel placed beneath, the process being encouraged by a stratum of 3 or 4 inches thick of a wet grass or aquatic weed called "seala" placed on the surface of the goor. The moisture from this attenuates the molasses in the goor and assists the draining. As soon as the weed is dry it is removed, and the upper stratum of the goor, now deprived of its molasses, is scraped off with a knife to the depth of 2 or 3 inches ; and a fresh top of "seala" or wet weed is applied : when dry, a further portion of sugar is cut off as before, and this is repeated until the basket or cone is emptied. The sugar as scraped off is exposed in the sun on mats to dry, and is then mixed and packed for

sale; and is, when well made, a dry, light, sand-colored dullooah. Thirty to forty per cent. of produce, varying with the quality of the goor, is made in this way from a given quantity of the latter. The resulting molasses having by the operation of the weed a small portion of the sugar-crystal melted with it, is subjected to a boiling to evaporate the water, and an inferior, weak grained, and dark coloured goor is the result: this is again subjected to the weed draining as before, and a further portion of ten to fifteen per cent. weight of the original goor is obtained. Dullooahs, if well dried before being packed, may be kept without deteriorating for several months if the weather be dry; but they always imbibe moisture, and sustain consequent injury from the damp air of the rainy season in Bengal.

4th. Pucka Cheenec, or Gurpatta, is the Native refined sugar, made by subjecting khaur to a process somewhat resembling that of the English refiner. The khaur is melted in water to the consistency of thin syrup, which is then placed over a fire in an earthen pan, and brought to boiling point, the defecation being assisted by potash temper and sprinkling in of cold water. After scumming, it is filtered through a cotton cloth, and the clarified syrup is then boiled briskly until the water is evaporated to such a degree as to allow the sugar to form a hard crystal as it cools. It is then poured into an earthen cone, and when cold the plug is withdrawn, and the syrup allowed to drain from it, assisted, as in the dullooah process, by the application of the damp weed or seala. As it becomes whitened by the latter, it is scraped off, sun-dried, and packed for sale. The syrup, as it collects from the cones, is boiled up with fresh goor, and produces by the same process an inferior or second quality of gurpatta, and the syrups of the latter are once more boiled alone, and produce a still inferior weak and reddish sugar called by the manufacturers "jerunnee," which is literally "lasts." Gurpatta if well made, and pure from mixture with other

kinds, is of a bright and clean aspect, fine and dry; and if protected from the weather will keep without injury throughout the rainy season. The ordinary yield of gurpatta from good goor is reckoned as follows: three maunds of good goor yield of—

					mds. srs.
First or white gurpatta,	..	..	..	0	20
Inferior or mixed ditto,	..	..	..	0	10
Syrups or jerunnee,	..	..	..	0	10
Molasses,	..	..	..	1	28
Loss,	..	..	..	0	12

Total, Mds. 3 0

5th. Dobarah is a quality superior to gurpatta, being a good white, dry, and well crystallized sugar. The process is similar to that of the gurpatta; but the material used being dullooa instead of khaur, a purer sugar is obtained, which much resembles the crushed refined sugar of the European refiner.

The expence of all the Native processes above described is extremely low, carried indeed to the last stretch of economy. Earthen pottery for boiling and crystallizing vessels, thatched sheds for protection from the weather, and bamboos and gunny-bags the sole substitutes for machinery, the expence of apparatus forms but a small item in the cost of the sugar. The labor forms the most important part of the expense, and next to that the cost of fuel, more especially in the twice-boiled descriptions.

It remains to notice that a considerable change has come over the business of preparing Native date sugars during the last ten years, arising from the increased demands of European sugar refineries in the vicinity of Calcutta, which have encouraged the production of a larger proportion of the date crop in the form of raw material best suited for them to

operate upon. These establishments have now been in operation for a sufficient period to prove that they can fulfil their purpose of preparing from the native raw product such qualities of sugar as are suitable for the consumers in the markets of Europe and Australia, and that they can do this with success and profit to the refiners, and with a better return to the shippers, than would be realized by the latter shipping the raw material, bearing the same rates of freight and charges. The experiment has now been fairly tried, and the result clearly arrived at, that the Native refiner, notwithstanding the extremely low cost of his apparatus and economy of labour cannot compete, in the preparation of the twice-boiled, or refined, sugars, with the European refiner operating with the vacuum pan and steam-engine, and above all with the aid of animal charcoal, the most valuable of all agents in modern sugar refining. It is true that the manufacture of Native refined sugars, dobarah, and gurpatta or *pucka cheenee*, is still nominally continued, but on a much reduced scale, and of inferior qualities to the product of a few years back; and it needs no great amount of vaticination to foresee that the art of preparing them, like that of the Dacca muslins of former days, is gradually becoming extinct, and superseded by the more scientific processes of Europe. The town of Santipore, on the Hooghly river, which twenty years ago produced from 20,000 to 30,000 maunds of dobarah sugar, for which it was much celebrated, per annum, now produces but a very insignificant quantity, and that is seldom seen in the market; and of gurpatta or *pucka cheenee*, but very little of good or genuine description is seen in Calcutta, the bulk of what is brought to market under those names, being now-a-days largely adulterated with dullooa or nimphool sorts, to reduce them to a price suited to the refiner for his use as raw material, either in Calcutta or in Great Britain.

SECTION. V.

On Improvements in the Cultivation and Manufacture.

In the preceding Sections, the endeavour has been made, first to trace the history and progress of the date tree cultivation, as a branch of native industry in Bengal;—secondly, to present a distinct view of the present state of the cultivation and elimination of the first raw product, or goor by the native husbandman; and, thirdly, to give a descriptive sketch of the subsequent treatment of the goor in the hands of the Native refiner, who brings it to various stages of purity, to suit the wants of the Native consumer or the European refiner.

There remains to be considered, in conclusion, how far the tree cultivation itself is capable of improvement, and whether a more economical development of its products could be attained, either by conducting the cultivation on an extensive and systematic scale, through the application of capital in forming date tree estates:—or by modified applications of European science and apparatus, already applied with success in refining from the goor, to the whole process of manufacture, commencing directly from the juice;—or by both these influences combined.

In the systematic cultivation of the tree, experiment has already proved in more than one favourable locality, that it can be conducted under few obstacles, and with every prospect of success as a remunerative investment. In Jessore district a plantation of 2,000 beegahs has been for several years past gradually forming, and will no doubt in due course become a far more valuable sugar estate than any of equal size in the West Indies or Mauritius, and amply repay the projectors for their patience and foresight. Another extensive plantation is already far advanced in the Hooghly district, and others have been commenced in the Soonderbund grants. In these plantations the trees are planted at uniform distances of 10 or 12 feet apart, and over regular

and uninterrupted tracts of land, so as to economize space and facilitate supervision.

To demonstrate the remunerative character of such an investment by a simple calculation, it will suffice to estimate the outlay required until the trees attain their proper growth for yielding goor, and to set off against this the revenue to be derived by leasing out the trees to the native cultivators for extracting the product on their own account, as customary with the petty Native tree proprietors in the date districts.

In Section III, the expence to the ryot for cultivating a beegah of the trees was estimated at 10 Rs. 12 as., inclusive of rent for five clear years, before any yield is obtained, and of every contingent expence for that period. There appears no reason for assuming a higher rate for planting on an extensive scale as the base of the calculation; to which should be added however, 1st, the charge for interest on capital invested in the plantation until the trees attain to yielding, and 2nd, the cost of general superintendence. In the following estimate, the interest on capital is allowed for at the Indian rate of 10 per cent per annum, and the cost of superintendence is assumed at 200 Rs. per month for a cultivation of 2,000 beegahs. It may be remarked on the latter item, that the labour of superintendence would be light; and it may be presumed that a portion of the time of a European planter, assisted by a good Native gomasta, would suffice for the work. In addition to the above rate for salary also, a further source of profit to pay for superintendence may be reckoned on from the between crops. At page 254 it was estimated that half the rent of the ground should be charged to the short crops cultivated between the trees. Rape, linseed, and teel are known to thrive well in such circumstances, and probably all the dry weather crops would do so equally well; and on ground already cleaned and ploughed for the date trees, such crops are raised at trifling expence, and meet a steady and remunerative market at Calcutta.

The estimate of outlay will therefore stand as follows :—

Outlay on 2,000 beegahs for plant-			
ing and cultivation for five years,			
at Rs. 10-12 per beegah,	..	..	Rs. 21,500
Superintendence at 200 Rs. per			
month for 5 years,	..	..	12,000
Interest on the above at 10 per			
cent., viz.,	..	..
On 1st year's outlay on plants and			
planting at 2 Rs. per			
beegah,	..	..	4,000
„ Rent and charges on			
ditto at 1-12,	..	..	1,750
„ Superintendence at			
200 Rs. p. m.,	..	..	2,400
			<u>8,150</u>
which at 10 per cent. for 5 years is,		Rs.	4,075
On 2nd year's outlay, viz.,			
„ Rent and charges			
@ 1-12	..	..	1,750
„ Superintendence @			
200 Rs. p. m.	..	..	2,400
			<u>3,900</u>
which at 10 per cent. for 4 years is,		Rs.	1,660
On 3rd year's outlay as above			
3,900 Rs. for 3 years,	..	..	1,245
On 4th year's outlay as above			
3,900 Rs. for 2 years,	..	..	830
On 5th year's outlay as above			
3,900 Rs. for 1 year,	..	..	415
			<u>8,225</u>
Total Interest,			8,225
Total Expence for 5 years			<u>Rs. 41,725</u>

For the returns as profit on such a plantation, if leased out to Native goor boilers as above proposed, the estimate would be thus :

2,000 beegahs each with 144 trees, the standard beegah containing 14,100 square feet English measure, and the trees being planted 10 feet apart, will give a total of 288,000 trees. And these leased out at a rent of 10 trees per rupee per annum, will yield an annual rent of, Rs. 28,800

Deduct annual charges as before for rent &c. at 1 Rs. 12 ans. per beegah, and superintendence at 200 Rs. per month, Rs. 3,900

Leaves nett annual income, Rs. 24,900

Which on an outlay of Rs. 41,725, gives a return of fully 60 per cent.

The rate at which the trees would be let out is taken at 10 per Rupee per annum. During the prevalence of high prices for sugar the rate in the date districts has been much higher, being frequently at 6 trees, and commonly at 8 trees per Rupee per annum. The rate of 10 per Rupee for trees in all stages of bearing, after the fifth year of growth, may therefore be considered an ordinary rate.

A cultivation holding out so tempting a rate of profit, and that upon a limited outlay of capital, and attended with so small a share of the common risks of agriculture, might well have been expected to have recommended itself earlier to the European planter and capitalist ; and their not having availed of it might seem *prima facie* to warrant a doubt of the correctness of the calculation on which such profits are based. The explanation of this is found in the following reasons :

1st. The length* of time required to obtain any returns from the plantation. To the European merchant or planter

a lapse of eight years to be passed before a profitable return can be realized, is too long a section of what most European residents hope to be the period of their sojourn in India. The fear of failing health in prospective, and the high rates of interest on mercantile capital always present to their notice, cannot fail to influence them, and to render any cultivation, which will offer a quicker return for their labours, the more attractive, however greater the risks attending such crops, indigo for example, may be.

2nd. The obstacles to the acquirement of permanent land tenures, and the general insecurity of titles to estates in Lower Bengal, are great drawbacks to investments in the soil requiring a series of years for development, however profitable *in prospectu*.

The remedy for both these objections is to be looked for in the gradual improvement in the administration of the government of the country, and in the more general introduction of the civilization of Europe, as working by its improved arts and manufactures, which such a government would foster. It has been but too often demonstrated that from the Native Zemindar of Bengal, however wealthy, or enlightened by school education, no enterprise or experiment will be undertaken which would lead him off the beaten track, by treading which he derives a certain revenue from his estates, however pressed or extorted from his impoverished ryots. With some few honorable exceptions, any project for improving the condition of the ryot, or any scheme for the improvement of the country by the application of the scientific or social systems of more civilized countries, finds no favor with the Native landholder ; neither the steam navigation of his rivers, nor the most promising railway lines through his primæval jungles find support from him. These, and the introduction of foreign staples into the agriculture of the country, have been left to the exertions and capital of the foreign ruling nation. It is to the same source we

must look for any greatly extended and systematic pursuit of this valuable cultivation.

To the manufacture of the date juice into sugar the European methods have not hitherto been applied in any way, and where, as in this case, experiment has been entirely wanting, any suggestions for improvement must be founded entirely on theory:—those about to be made, can only claim, in addition to this, the merit of having been made after frequent local observation of the Native process for the production of goor. So large and growing a branch of agricultural industry carried on by such rude and simple processes, and with so vast an expenditure of manual labor in proportion to the results, would seem to offer a fair field for the application of economical contrivances.

At page 258 it was shewn that of the total expenses of producing the goor from one beegah of date trees reckoned at Rs. 59-4, Rs. 28, or nearly one half, was for the item of labor: this is expended principally in the active, and often dangerous, service of climbing the trees twice daily, to empty and reset the earthen pot in which the juice is collected. Any process, which would materially reduce this labor ought *primâ facie* to effect a proportionate reduction in the cost of the goor.

It would seem quite possible to effect this by discarding the earthen pot altogether, and conducting the sap flowing from the trees of several beegahs of plantation to a common reservoir planted in a central position, to which the sap might flow along a series of gutters slightly inclined towards it. With the scattered and irregular planting of the Native ryots this would of course be impracticable, although not so in a systematic and regular plantation.

Let us suppose for example a square of 100 beegahs of regularly planted and full grown trees, divided into equal quarters of 25 beegahs each, and a reservoir or juice boiler placed at the point of intersection of the dividing lines, as in

the accompanying sketch, then suppose that a tributary gutter be placed between every second row of trees, as from A to B, and that these tributaries are all made to incline towards a main gutter inclined from B to C. It will then only require a short gutter to slope from the notch cut in each tree, and to conduct the sap into the tributary, and it is evident that the whole product of the 100 beegahs would flow in a continuous stream to the central point at C. Here the operation of boiling into goor might be conducted without intermission in two or more vessels, the juice being conducted into each alternately as required, the operator boiling all into goor as soon as collected.

It is obvious that by this method two-thirds of the labor of tree climbing would be saved, and the produce might reasonably be expected to prove of better quality than by the ordinary method, inasmuch as on the juice being brought to a boiling temperature within a few minutes after its leaving the tree, all fermentation would be obviated : it is even probable that the juice which exudes during the day, and which is now wasted by the cultivator, owing to its so rapidly passing into fermentation, might by this means be economized, and a considerable per centage of additional produce be thus obtained from the tree.

The only objections which present themselves to the application of this process are, 1st, the somewhat irregular growth of the trees, which might render it difficult to obtain the required elevation from the whole of those situated farthest from the centre ; and, 2nd, the expence of guttering. To the first it may be remarked that irregular growth is mainly owing to defective planting, either by using seedlings of various growths and seasons, or by allowing the young trees to be cropped by cattle, which either stunts their growth, or necessitates their being replaced subsequently to the original planting. By care in the original selection of the plants, and by fencing the young plantations, these evils

might be prevented ; and that a generally regular height of trees could be attained is sufficiently evident from the appearance of plantations where no endeavours have been made to promote it. The expence of gutters would not be so great as might at first glance be expected. It would be found that for all the tree gutters, and probably for all those I have denominated tributaries, the large hollow kind of bamboo, divided longitudinally, and with the medullary divisions removed, would answer all purposes, light wooden drains of saul or jarool being required only for the four main channels. Without troubling the reader with details in this place, it may suffice to state, that the total expence of gutters, including wooden supports, for a square of 100 beegahs, has been estimated at a first cost of 2,400 Rs., or 800 Rs. per annum, assuming that they would serve for three years' use. If preserved by a previous immersion in creosote they might be expected to serve much longer. Then, reckoning the expence of labour as at page 269 at 28 Rs. per beegah, or 2,800 Rs. per 100 beegahs per annum, and that two-thirds of this could be saved by the new plan, the labourer having to climb the tree but once a week to recut the sap vessels, in lieu of twice a day for three or four days consecutively as at present, and we have a saving in cost of Rs. 1,067 (viz., two-thirds the labour 1,867 Rs. less for guttering 800 Rs.) for the season, besides what might be derived from the improved quality of produce obtained, and from any extra quantity derived from the day juice. Looking at the evident tendency to an advance in the rate of labour in Bengal, these suggestions may be found valuable to the intending planter.

Whether any advantage could be obtained by applying to the date juice the improved sugar refining processes of Europe, such as the vacuum pan, the animal charcoal filter, and the centrifugal machine, is a question on which it is more difficult to theorize than on that of improving on the Native process for producing goor. It has been found

difficult to apply such improvements on sugar-cane estates, it remaining an open question whether the improvement in the product is sufficient to counterbalance the large outlay and apparatus which can be used only during the gathering of the crop. If this is the case with cane cultivation where the whole produce of any particular field is gathered, collected at a central spot, and its sugar extracted and prepared in a few hours, it is easy to comprehend that there are at least equal difficulties to be solved in applying them on a date plantation, where the produce is collected over three or four months, and has to be conveyed in a liquid state over considerable distances if required to be collected in quantity.

An ordinary sized vacuum pan contains about 100 maunds of sugar, and we may suppose it to be charged full at least three times daily throughout the date crop season of 90 working days, as the minimum of duty it would have to perform to compensate for the expense of its erection. This would require 300×90 , or equal to 27,000 maunds of goor, to be collected for it, or about 1,000 tons. As the date juice contains only one-tenth of its weight of solid sugar, it follows that about seven-eighths of the whole would have to be evaporated in the vacuum pan, to bring the residue to the proper density for crystallization, and to effect this it would be found that not more than three charges for 24 hours, as above estimated, could be completed. And taking the yield of goor per beegah, as at page 256 at $78\frac{1}{2}$ maunds, it follows that an area of 343 beegahs of trees in full bearing, would be required to supply this. Under the most favorable circumstances the result would be, that to produce 1000 tons of uncured sugar, or goor, eight times that weight of juice would have to be conveyed over distances varying within a radius of half a mile, at great expense of labour, and great risk of loss by fermentation.

A far more promising mode of operation would be to subject the juice to a preliminary boiling in open vessels as it leaves

the trees, sufficient to evaporate the greater portion of its water and occasion a partial crystallization; and to collect this extract, to be subject to a process resembling that of an ordinary sugar refinery, to complete its conversion into the best qualities of sugar.

It is well known to sugar refiners that the deterioration in crystal and color which all saccharine juices suffer from long exposure to high temperatures, takes place to a limited extent only until after the greater part of the aqueous portion is evaporated. The more economical plan of operation therefore would be, first to divide the date plantation into convenient sections for collecting the juice and subjecting it, fresh from the trees, to the preliminary open air evaporation until it indicates 45 degrees of Beaumè's saccharometer: this would effectually obviate loss by fermentation, and allow of a partial crystallization in cooling. The product could then be conveyed to the central factory, and worked off at convenience, by reducing it with water to the density of 25 degrees of Beaumè, heating to boiling point for the purpose of coagulating the glutinous portion, and then straining the clarified liquor through animal charcoal, and passing it from thence to the vacuum pan, there to be crystallized in the ordinary way. The vacuum pan having by this method to evaporate the water from a much denser liquor, would occupy for each charge less than half the time it would have required with the raw date juice, and consequently could operate on double the quantity of sugar in the same space of time, add to this that a portion of the material might be kept by, so as to extend the working season over four or five months, and it would be found that 3,000 tons, or fully three times the quantity of material could be worked, as compared with the plan of working at once on the juice in vacuo, for a season's operations.

The above described process, as well as that for collecting the juice suggested in the previous pages, requires, it may

be repeated the test of experience; but with this reservation, there appears no reason to doubt that the two combined would establish a vast improvement on the present Native method; and that the whole available product of the tree would be obtained in an improved state, and with the minimum of waste in the manipulation: finally, that the increase of per centage in weight obtained; the improvement in quality, and the economy in working expense always realized by operating on wholesale quantities, would, all combined, be found to more than compensate for the necessary first outlay for efficient apparatus, and superintendence.

The general conclusion pointed at throughout the foregoing pages, is that the production of date sugar is one of the most important and valuable pursuits which can claim the attention of the Bengal planter or landholder, European or Native, whether we consider the highly remunerative returns the crop affords, its immunity from risks of failure, or the valuable nature of the product, as one of the necessities of life. The writer has the conviction that its merits require but to be more generally known to recommend it to the body of British capitalists and British settlers in India, whose numbers under the influence of recent political events are increasing, and must continue to increase. Fairly considered, there is nothing extravagant in the prognostication, that date tree estates may after a few years prove as remunerative in the plains of Bengal as tea estates promise to be along the hill slopes by which those plains are bordered.

The Green Dye of China and Green Dyeing of the Chinese ; by Monsieur NATALIS RONDOT, with sundry papers on the same subject by other authors : Translated from the French by HENRY COPE, Esq., of Umritsur.

PREFACE.

I received from Shanghai, subsequent to the year 1853, sundry information regarding the green dye of China. These notices were, in some degree, supplementary to those forwarded from China by the Rev. Father Louis Helot, and the Rev. Joseph Edkins. The Chamber of Commerce of Lyons having decided on the proposition of Mr. A. F. Michel, one of its members, to offer a prize for the investigation of the green dye of China, in regard to exotic and indigenous plants, it became necessary to add certain explanations to the documents previously published, and to make known to the public all the facts bearing generally on the art of green-dying by the Chinese. I re-arranged all my notes with this object, and forwarded them to the Chamber of Commerce. They were accompanied by a letter, dated the 18th March, 1857. They were read to the Chamber at a meeting held on the 10th April, and the institution did me the honor to order them to be printed.

Since then I have instituted still more extended enquiries, and I have obtained most useful particulars, on points hitherto obscure. Mr. J. Decaisne, of the Academy of Sciences, has been so good as to undertake the description of the two species of *Rhamnus*.

I have thus been led to modify the paper I presented to the Chamber of Commerce, which accepted my more recent work on the 24th July, being the third which has been published by order and under the auspices of the Chamber of Commerce of Lyons.

The first edition exhausted, includes the report of Mr. Michel ; the successful attempts of Messrs. C. Benner,

Dupway, and others, were therein explained and discussed. No chemist, dyer, or printer, who has communicated the results of his experiments to the Chamber, has been more persevering and more successful in his labours than Mr. Michel. He has detailed in his report his own peculiar observations, and the process of analysis and of dyeing which he has discovered.

The second publication contained several documents, of which the most interesting came from the Rev. Father Helot. They were prefaced by a more recent report from Mr. Michel. That gentleman has undertaken, since January, 1857, with the ability and intelligent precision for which he is so well known, investigations into the coloring matter of indigenous *Rhamni*. These investigations have resulted with the discovery of the *lo-kao*, in the still more important discovery of the peculiar and very remarkable action of light on certain vegetable juices.

It was to be regretted that Father Helot should have reached Azé at a time when the work-shops were closed, and that he was obliged to rely on the reports of the workmen; for as Father Bourgeois wrote from Pekin in 1784, "the local workmen do not tell their secrets"—a saying applicable to the race of the present day. But during a second trip to Azé, in 1857, after the Easter festival, this zealous Missionary saw in practice the singular operations which he had already made known, and he certifies in a letter that will be found hereafter, the correctness of the accounts he had previously given. The first memoir of Father Helot was already considered valuable, but its value has been materially increased by his assurances of its reliability; he illustrates in his person the accounts, so frequently quoted, by which our ancient Missionaries, Fathers Gaubil, d'Incarville, d'Entrecolles, Arnid, Abot, Collas, &c., were so useful, and became so celebrated. The enlightened measures adopted by the Central Council for the work of

the Propagation of the Faith, lead us to hope that both science and art will be indebted for new services and conquests to our missions in China.

It will be observed in the course of my remarks that Mons. C. De Montigny, French Consul at Shanghai, and Mons. D. Remi, of the same town, have taken an active part in these investigations. The discovery of the two species of *Rhamnus* is due to Mons. de Montigny. Our "Chargé d' Affaires" in Siam and Cochin China has materially added to our agricultural knowledge; it is to him we owe the Yak, the Yam, the Dry Rice, Sorgho, &c. Thanks to his influence, and to his intelligent exertions, Lyons, receives, since 1852, direct and important consignments of Chinese silk. My knowledge of the energy, devotedness, and patriotic zeal of my former colleague in the mission to China, is sufficient to assure me that he will do much more than he has hitherto achieved. Mons. Remi is the principal member of a respectable French commercial firm at Shanghai; he has zealously followed out with Mons. Edan, now officiating for Mons. de Montigny, the investigations commenced by the latter, and has afforded me a mass of useful information. It was necessary to know what Chinese books said of the *lo-kao*; one man only could, in Europe, undertake the necessary enquiries in those valuable Chinese and Japanese Cyclopædias, the examination of which is as interesting as it is difficult; but they were a mere pastime to the illustrious translator of the memoirs of Hiouyn-Thsang: but Mons. Stanislas Julien, of the Institute, whose marvellous acquaintance with the Chinese language is as wonderful as his ardent inquiries into the realms of science and the arts, has found no trace of the *lo-kao*, and the plants from which it is obtained, in the botanical and agricultural treatises published about the middle of the last century. The use of this lac in dyeing is not traceable, according to the Rev. Mr. Edkins, for more than 25 years; even its use as a water

colour if less recent, is not over much more ancient. The authors of the *Thien-kong-Khai-wou*, and of the Japanese Cyclopædia, would hardly have passed over in silence such a singular substance.

I am grateful to the obliging services of my friend Mons. Stanislas Julien for the translation of the Chinese texts quoted by me in the course of my remarks.

The author of the "Treatise on the Printing of Tissues," has, in compliance with my request, consented to separate from a "Memoir on the Green Dye of China," that portion in which he details, as the result of his experiments, the chemical and dyeing properties of the lac. It is not necessary for me to indicate the importance of this unpublished work, undoubtedly original in its conclusion, throwing a new light on the history of this truly interesting substance, the origin and true nature of which are still doubtful questions with some men of science.

PART 1ST.

THE GREEN DYE OF CHINA.

I.

Of the Discovery of the Green Dye.

The history of the *Green Dye of China* is singular. Its existence even is no where mentioned before the year 1845. It was obtained in China about that time, and brought to France in 1846, but it continued unknown till 1852; the discovery of its properties dates from 1852. It may be stated that we are still ignorant of the true nature of this most singular substance, and it is difficult to form an idea of the precious and varied resources it offers to the dyer and the printer.

The Commercial Delegation attached to the Embassy in China were the first to obtain the *Green Dye of China*, but without paying any attention to it. There could be no doubt

about it, for what other dye-stuff could be valued on the spot at 224 francs the kilogramme? It is thus mentioned in the "Etude pratique du Commerce d'exportation de la Chine," under the head of "Vegetable Dye Stuffs," page 199 : *Kong-lok*" (in the dialect of Canton). This substance is extracted from the leaves of a tree of that name ; it yields a very valuable green color, comes from Tse-tchonus, and costs 24 dollars per catty. It is used for painting. We obtained this account of it, and the substance itself, from Yi-diong, Senior, one of the first silk manufacturers, and from Ting-Kona, a painter.

It is to be observed that the nominal price has not varied since then. The catty which was 24 dollars at Canton, in 1845, was still obtainable for 24 dollars at Shang-hai in 1857, but the exchange was very different ; it was 5 francs and 65 cents at Canton, in 1845, and at 9 francs at Shanghai in the middle of the year 1857.

I frequently visited in 1845 the dyeries of Canton. I noted in four of the largest, and especially in those of Hou-ching, manufacturer of silks, and of Kong-tching, the process for dyeing cotton and of grass cloth thread, (thread of *Urtica nivea*) ; I never saw them use the *lo-kao*, but it was mentioned to me. I find in my journal, under date 17th August, 1845, that my interpreter Atchum, brought me, with other dye-stuffs I had ordered him to purchase, some *louk-ko*, for dyeing in green, of which the price was 28 dollars per catty.

The Delegates had in their collections some calicoes dyed in different shades of green ; none of these were specially mentioned by them. They were bought at Shanghai, and at E. Moru (Amoy.) These calicoes were exhibited at the Municipal School Turgot, between the 21st July and 28th August, 1846, when more than thirty thousand persons visited the Exhibition, but these green dyes were not then noticed. The *lo-kao* itself was there : 1st, in a box of paints in the form required for painting, (No. 1392 of the Catalogue) ; 2ndly, in the silk-dyeing form, being the small sample I

had purchased at Canton on the 17th August, 1845 (No. 1866 of the Catalogue).

In 1848, Mons. de Montigny, Consul at Shanghai, forwarded to the Minister of Commerce, with other Chinese productions, 44 specimens of calicoes, and some other colouring matters. The calicoes of the collection of the Delegates, and those sent by Mons. de Montigny, were distributed, in October, 1849, amongst the Chambers of Commerce of Malhausen, Rouen and Lille.

The cloths dyed green were named in the Catalogue of Mons. de Montigny, *liou-sai*. Father Helot states (pp. 27 and 32) that these cloths are known to the trade by the name of *so-lo-pou* (green-color-cloth) when dyed with the bark; *ngheou-lo-se* (green-nymphæa-color) and *nghiou-lo-pou* (green-nymphæa-cloth) that is, cloth dyed of the color of the leaves of the *nymphæa*, when dyed with the *lo-kao*.

Each piece of *liou-sai* is seventeen Chinese feet long, one foot, or one foot and one inch broad, and cost at Shanghai, in 1848, 50 to 53 hundredths of a dollar, or (according to the exchange of the day 6 francs 20 cents) from 3 francs 10 cents to 3 francs and 30 cents. The following are the size, weight, and price of three pieces :

6 metres	12 long :	0 35½	broad ;	461 gr. ;	51 cents per metre
6	„ 36 „	0 35½	„	463 „	52 „
6	„ 30 „	0 38	„	467 „	52 „

Father Helot considers that the value of a square metre of cotton cloth dyed with the bark, or the *lo-kao*, is 5 hundredths and 7 thousandths of a dollar (about 50 cents at the exchange rate of 9 francs per dollar.)

Mons. de Montigny also sent, as I have already mentioned, certain dye-stuffs, and there were among them the following green matter :—

“Ten catties (6 killogrammes 047) of *pih-chow-elle* (I give the word as written by Mons. de Montigny himself) green colour ; price 4,920 sapeques (about 26 francs.)

“ Fifty catties (30 killogrammes ·235) of *tong loh*, green paint, said to be prepared from the *no-me*, cost 20,800 sapeques (about 107 francs).”

The Ministry of Agriculture and Trade, by which these samples were distributed, as well as the dye-stuffs brought by the Commercial Delegates, amongst the Imperial manufacture of the Gobelins, the Museum of Natural History, the Chambers of Commerce of Lille, Rouen and Mulhausen, received no notice of the nature of these matters.

Tong-lo is the word for verdigris, and approaches closely to that given to the Delegates (*Tsong-lok*); *Commerce d'exportation de la Chine*, p. 199.

The gummy rice is named *no-mi*. It is probable that *no-mi*, as written by Mons. de Montigny, is not exactly the name of the plant, and that *tong-loh* is the green substance obtained from the berries of the *lo-chou*.

In 1848, according to Mons. Matthieu Plessy, Mons. Dan. Kæchlin Schouch, of Mulhausen, one of our most distinguished manufacturers, noticed a new green in a Chinese calico. The Chamber of Commerce of Mulhausen only received the cloths I have mentioned above, in November, 1849, but the following explanation of this apparent discrepancy of dates, has been afforded me by Mons. J. Albert Schlumberger, President of the Chamber:—

“The Delegate of the Chamber to China, on his return from his Mission, in 1845, brought us amongst other things, some green and red-dyed stuffs, on which, and especially the green, numerous experiments were made by our chemists.

The first document that alludes to this green dye, is a letter addressed by the Chamber of Commerce of Mulhausen, on the 27th April, 1850, to the Minister of Trade, in which they beg of him to make enquiries in China,—“regarding the green colouring matter used as a base to dye the green of the samples, which have been ascertained by

analysis to be dyed with the same colouring matter, being a dye stuff of a peculiar nature and unknown in Europe."

This question, the precision of which is remarkable, for it notices—1st, the green base secured by the same colouring matter, 2ndly, a green dye-stuff of a peculiar nature unknown in Europe. This question, I say, was prepared by the Chemical Committee of the Industrial Society of Mulhausen.

It appears by a recent declaration of the Presidents of the Chamber of Commerce, and of the Industrial Society of Mulhausen, that Mons. Daniel Kæchlin Schouch, was the first to notice the singular colour of the green calicos dyed in China. Even at that time experiments had proved to that learned chemist, that this green changed to orange by the protosalts of tin, and to violet by fermentation. The letter of the 27th April, 1850, was initiated by him.

Seventeen months afterwards, in September, 1851, Mons. Daniel Kæchlin sent to Mons. Persoz a sample of this green cloth, dotted with small violet spots, and the dyeing of which was still an enigma.

M. Persoz succeeded in procuring, thanks to the zeal of his friend Mr. P. J. Forbes, Consul of America at Canton, about a gramme of the colouring matter. The request was made at the end of November, 1851; the lac was in Paris by the end of March, 1852. Mons. Persoz gave a part of this already very small sample, to Mons. Kæchlin, to Mons. Guinon, of Lyons, and to Mons. Espinasson, of Rouen. The paper containing it was sent to me on the 4th May, by Mons. Persoz. It bore a Chinese inscription, traced on running characters next to illegible. It indicated neither the name, nor the origin, nor the mode of using; it bore merely the price of the sample: (*tse-kia-liang-youen*, the price of this is two dollars.)

On the 5th April, 1852, Mons. Legentil, President of the Chamber of Commerce of Paris, had written to the Minister for Foreign Affairs, begging to make enquiries in China, and

handed to him for transmission to our Minister in that country, a note which had been drawn up by Mons. Persoz (2nd April). "The Chinese," said he, "possess a blue colouring substance, that dyes in green mordants of alum and iron. This substance contains no indigo, nor any matter obtained from that colouring principle. It was considered desirable to ask—'By what process it was prepared, and whether lime or chalk were used?'"

Mons. Persoz presented to the Academy of Sciences, at its meeting of the 18th October, 1852, a note that was published in the *Report of its Proceedings*, Vol. XXXV, pp. 558 and 559.

Some days afterwards (26th October, 1852,) the Minister of Foreign Affairs forwarded to the Chamber of Commerce of Paris, a despatch from Mons. de Bourboulon, Minister in China, dated Macao, 21st August, 1852.

This document was to the effect that—"Mr. Forbes could only obtain in Canton a quarter of a catty of the lac required. It costs at Canton, 35 piastres per catty. It is asserted that it is obtained from a flower. There are in China two other methods of dyeing green: 1st, with the flowers of the *hoai-hoa* and indigo (this will be mentioned hereafter); 2nd, with indigo alone, (the cloth dyed indigo being first exposed to the action of frost, and then to the rays of the sun.)"

The communication by Mons. Persoz to the Academy of Sciences was not likely to pass unnoticed. M. Seringe, Professor of Botany at Lyons, brought it on the 10th November, 1853, to the notice of the Chamber of Commerce of Lyons. This body took the question into consideration at its meeting of the 25th November.

The Chamber did me the honor to write to me on the subject, on the 7th December. I was requested first to collect in the offices of the Minister of Commerce, and of the Chamber of Commerce of Paris, as also from Mons.,

Persoz, every fact that might assist in directing the further study and application of known results, and enlightening its enquiries; 2nd, to discover by what means the green dye might be obtained in sufficient quantities to admit of practical experiments on a more extensive scale. My answer was sent on the 12th December. The Chamber, which never shrinks from any expense when the arts of the town are in question, voted, at its meeting of the 16th, the purchase in China of about five kilogrammes, and the opening of a cash credit to the extent of 3,000 francs.

I commissioned my friend Mons. D. Remi, a French merchant at Shanghai, to effect this purchase, and the Chamber received, in October, 1853, 160 taels of *lo-kao*, at 1 piastre and 35 cents per tael. It was packed in 19 small boxes, and had been bought at Sou-tcheou-fou; the net weight was 5 kilogrammes 590. The cost, with charges, amounted to 2,158 francs, 55 cents. The price per kilogramme was therefore 386 francs.

Mons. Persoz, in the course of a journey to Lyons, before presenting his note to the Institute, had mentioned the green dye to Mons. Guinon; that gentleman, on the 24th September, 1852, requested Messrs. DesGrands to obtain some for him. This commission was forwarded to Messrs. Carvalho and Co., of Canton, and Mons. Guinon was in possession, in March, 1853, of 256 taels of *lo-kao* of the first quality, and of two taels of the 2nd quality, purchased in Canton in December, 1852, at the rate 3 piastres per tael for the best, and 2 piastres for the second. Mons. Guinon offered on the 14th March, to make over a portion of this to the Chamber of Commerce. The Chamber agreed to take two kilogrammes, and received them on the 14th April, at 533 francs per kilogramme, being the cost price.

At a later date the Chamber distributed the *lo-kao* gratuitously, in quantities of from 5 to 10 grammes to about fifty chemists, dyers, calico-printers, and painters.

The claims of Mons. D. Kæchlin, to the discovery of the green dye has been established in two publications of the Industrial Society of Mulhausen ; one is the report presented to a general meeting, held on the 28th December, by Mons. Daniel Dollfus, junior ; the 2nd being a note read at the meeting of the 31st August, 1853, by Mons. E. Mathieu Plessy.

It is desirable to mention the fact, and I have named my authority : Mons. Persoz has forwarded to me, as referring to this subject, the following extract from a letter addressed to him by Mons. D. Kæchlin, on the 31st May, 1857 :—"To tell you the truth, it was only on reading your letter that I remembered that Mons. Plessy had read a paper on the green dye while I was absent at the waters in August, 1853, a paper which I had never read, and I am free to admit that if it had been known to me, I should have altered the tenor of the portion relating to you."

Subsequent to the report of the *lo-kao* by the Chamber of Commerce, considerable quantities have been received at Lyons, in Paris, and in London ; it has become an article of trade, and its price is regulated according to the demand.

In foreign countries, it is, if I be rightly informed, in Holland that the *green dye* was first received after France. The Industrial Society of the Netherlands obtained it towards the end of 1853 from the Dutch Consul in China. The *lo-kao* which was in 1853 used by Messrs. Walter Crum and John Mercer in their experiments, was given them by Mons. Persoz.

II.

OF THE SEVERAL COLOURING MATTERS THAT HAVE BEEN MENTIONED AS IDENTICAL WITH THE LO-KAO.

The history of the *green dye of China* would be incomplete if I were not to give an account of the green substances of which botanists, travellers, and chemists have furnished

notices, and which have been considered identical with the *lo-kao*, without any present grounds to justify such a surmise; in fact it is necessary I should treat of these matters. Should these several substances prove to be green dyes differing from the *lo-kao*, it is desirable to indicate them with a view to further investigations; if any of them should prove to be the *green dye* itself, its history will have been enriched with new facts. Lastly, if it should be proved that they are not green dyes at all, it will be needless to devote any further attention to them.

1.—*The Tsai, of Cochin China, mentioned by Poivre, about 1750, and Father Horta in 1766.*

Peter Poivre, born at Lyons in August, 1719, is celebrated for the great services which he rendered to the French Company of India and the Isles of France and Bourbon. He naturalised in these islands the nutmeg tree, the clove tree, the sago palm, the bread-fruit tree, &c. Poivre went to Cochin-China in 1749, as Minister from France, had a warm reception from the Emperor, and was in a position to obtain accurate information. Here is what he has written in a small work, printed at Verdun in 1768, entitled: *Tracts of a Philosopher, or Observations on the Manners and Arts of Africa, Asia, and America.*

"They" (the Cochin-Chinese) "cultivate the cotton plant, the mulberry, pepper, the varnish plant, the areca palm, tea, indigo, saffron, and a plant peculiar to their country named *tsai*, which being fermented like the indigo, furnishes an abundance of green flowers, which of themselves yield an emerald green and persistent dye. This plant would be a valuable accession to our American colonies." (p. 95.)

This passage is to be found in page 70 of the edition of the year, and it is repeated in the *General History of China* 1785, Vol. XIII (supplementary volume edited by the Abbé Grosier) page 218, and in the *Description of China and of*

the States dependent on the Emperor; by the Marquis of Fortia d'Urban, 1840, Vol. III, p. 135.

Father Horta, says in 1766 :—

“The Tongkenese cultivate a plant named *tsai*, which, being steeped, furnishes a green flower, that yields a very strong emerald green dye. I believe this plant is only found in Tongkin and Cochin-China.”*—(*Lettres Edifiantes* 1781, Vol. XVI, p. 239.)

The word *tsai* is not Cochin-Chinese; it is a Chinese word that may be written in two ways;† under the first form, it signifies plant or herb, and the second, pot-herb or vegetable.

2.—*Dinh-xanh, of Cochin-China.*

Charpentier de Cossigny published in Paris, in the year VII, a book under the title of *Voyage to Canton, with Observations on the Voyage to China, of Lord Macartney and Citizen Van Braam, a sketch of the Arts of the Indians and Chinese.*

“The Cochin-Chinese,” says he, at p. 588, “possess a plant which they name *dina-xang*, very much like our balm, from which they obtain, by means of trituration in water, a green fecula,‡ with which they dye cloths in every possible shade of green. All my endeavours during the last thirty years, to obtain the seed of this plant have been fruitless.”

The same writer again mentions this plant, and its dyeing fecula, at pp. 224 and 232 of the work mentioned above, at page 270 of the second volume of his *Voyage to Bengal*, and at page 353, of Vol. II., *On the means of improving the Colonies.*

* The use of the exact words of Poivre by Father Horta would lead to the very fair inference that he was repeating what Poivre had written before.—TRANS.

† Mons. Rondot gives the Chinese characters which our Calcutta printers have not the means of reproducing.—EDRS. JOURN.

‡ The extractive portions, yellow often, are combined in such proportions and quantity that they can easily be separated.—Cossigny, *Means of Improvement*, Vol. II, p. 353.

Peter Blancard, who for many years navigated the Indian seas, also mentions the *dina-xang* in his *Manual of the Trade of India*.

“The low lands (of Cochin-China) produce . . . a plant of great value, unknown in Europe, which would of itself enrich a whole colony: it is known by the name *dina-xang*: it yields, by fermentation, a green dye fecula used in dyeing cloths green of all shades; the Europeans call the plant *Green Indigo*” (p. 345).

Blancard never was in Cochin-China; he knew Charpentier de Cossigny (p. 344), and most likely obtained from him the little he knew of this green fecula.

I bought Blancard's works at the sale of the late Mr. Borel at Batavia. Borel had been several times to Cochin-China; he had moreover lived in the country for more than twelve years, and was the Agent at Batavia for the Emperor Annamite; and wrote the word *fable* at the end of the passage I have quoted.

I was myself at Touranne, in Cochin-China in the month of June, 1845; Monseigneur Lefevre, Bishop of Isauropolis, Vicar-Apostolic of Lower Cochin-China, who had just been rescued by the frigate *Alcmène*, and been conveyed to Macao, added some notes to the copy of the book commented on by Borel. He saw the remark about the green dye yielding plant, and differed from him in opinion. He was acquainted with a green dye.

I learnt from one of my Cochin-Chinese interpreters at Touranne, that there is a plant which does yield a kind of indigo, dyeing both silk and cotton green, that it grows in the Provinces of Quang-nam and Quang-duc, especially in the latter in the vicinity of Houé-fo. I could obtain neither the plant nor its product. Mons. Itier also mentions it. Mons. Hedde even names the price at which it was to be bought at Touranne, namely one quan and half the pound. As at that time (June, 1845) four quans were equal to

one pillar dollar, the cost was about 3 fr. 60 c. per kilogramme.

The fecula of the *dina-xang* may possibly be the same as that of the *tsai* mentioned by Poivre and Father Horta, and as the indigo indicated by Messrs. Heddes, Itier and myself.

I ought to state that J. de Loureiro, Monseigneur Pigneaux and Monseigneur Taberd, do not allude, the first in the *Flora Cochinchinensis*, the two others in the *Dictionarium Anamitico Latinum*, to any plant of the name of *dina-xang*. It is more correct to write *dinh-xanh*, and I mention that *xanh* signifies *green*. Thirteen Cochinchinese characters can nearly all be pronounced *dinh*, and I cannot therefore say which in particular is given to this plant.

Charpentier de Cossigny devoted much of his attention to indigo in India, in Mauritius, and in France; he was particularly interested in the green indigo, and made many experiments in this new direction. He presented a memoir to the Directory on the extraction of indigo from the woad, and he has alluded, without naming it, to a plant in Europe yielding a green fecula (*Voyage to Canton*, p. 292.) He no doubt means the blue flowered Scabious, used in Sweden to dye woollens green. I may nevertheless draw attention to a singular coincidence. The *dinh-xanh* is not unlike our balm, according to Charpentier de Cossigny, and Buchoz states in his *Treatise on Plants useful in Dyeing and Painting*, that the leaves of *Melissa officinalis*, Linn., yield, under the action of spirits of wine, a permanent green dye (p. 131). Mons. Persoz draws attention to the probability that the vague designation of de Cossigny was perhaps more applicable to *Mercurialis perennis*, which yields a permanent blue green, distinguished by the presence of indigo.

3.—*Green Indigo, prepared by Charpentier de Cossigny, in 1779.*

After noticing the *dina-xang*, Charpentier de Cossigny announced "that the indigo plant (*Indigofera tinctoria*), also

yielded a green fecula when boiled by a process differing from that followed by the indigo-factors to obtain the blue."

He enlarged on the subject in a letter addressed by him on the 12th September, 1779, "to LeMonniers, Member of the Academy of Sciences; it was printed after the *Essay on the Manufacture of Indigo*. I have found some details in *The Means for Improving the Colonies* (Vol. II., pp. 233 to 236):—

"The processes for obtaining it, (green indigo) are very simple. Heap up the fresh leaves of the plant; moisten them with a little pure water, or limewater for an hour; press them; separate the water that will flow from them, which must be filtered two or three times through a thick cloth; add more water to the mass of leaves, so as to wet them thoroughly, and then submit them again to pressure for an hour. Filter the second liquid for several times. The two liquids thus obtained may be mixed or kept separate. I noticed that the first yielded a brighter color than the second

"Add a considerable quantity of limewater to the liquids; stir them, then allow them to stand, and pour off the water. The residue will be found to be a fecula of a fine green.

"This must be washed several times in limewater, and then several times successively in boiling water.

"The indigo plant yields a larger quantity of green than of blue deposit.

"The green parts thus obtained is, like indigo, indissoluble in water; it does not even mix with it, though it seems to be somewhat more viscous. When fresh and damp, it tinges paper and cloth a deep permanent green; when dry it is black. The paste is very fine, but without lustre, it takes a polish, without assuming any colour or coppery shade, when rubbed with the nail.

"A still more elegant result is obtained, by using the leaves only, instead of the leaves with the stems.

“The indissolubility of the green indigo in watery, spirituous, acid, or alkaline menstrua, requires that it should be treated in the same manner as indigo colour to be used for painting. Fermentation might decompose it, and induce a change of colour.”

4.—*Kim-long-Nhuom of Cochín-China.*

Noticed by J. E. Lourcero about 1780.

It is probable that the *tsai* of Poivre and the *dinh-xanh* of Charpentier de Cossigny are one and the same plant; the resemblance to balm leads to the supposition, as already stated, that the Cochín-Chinese plant belongs to the genus *Melissa*, or is identical with *Mercurialis perennis*. Such, however, is not the opinion of Correa, who thinks that the *tsai* of Poivre is the *Justicia tinctoria*.

This Acanthanous plant is certainly indigenous in Cochín-China. Louriero (Vol. I, p. 25,) alludes to its applicability as a dye: “*Folia viridi colore saturata, eodem telas pulchre imbuunt.*” Messrs. Pigneaux and Taberd, agree with Louriero in this account of its properties, and as to the Cochín-Chinese name of *Kim-long-Nhuom*. The *Justicia tinctoria* of Lour. and Roxb. is the *Peristrophe tinctoria* of Nees.

5.—*Cay-boung-boung, and the Cham-lon-la, of Cochín-China.*

Noticed by J. de Lourcero, about 1780.

More Cochín-Chinese plants whose beans yield a green color.

The *Cay-boung-boung* serving Louriero as a type for his genus *Aletris*, has been named by him *A. Cochín-Chinensis* (Vol. I. p. 204), it is the *Sansevieria late-virens* of Haworth. It is mentioned by this name in the *Hortus floridus Cocin-cinæ*.

According to Lopreiro (Vol. II, p. 484) a blue and a green colour is obtained from the pounded leaves of the *Cham-lon-la* (*Optimam tincturam cæruleam, viridemque.*) He adds that

this colouring matter is also obtained from the indigo plant, and that the produce of the latter is equally brilliant. The *Cham-lon-la* is the *Spilanthus tinctorius*, Lour., or *Adenostemma tinctorium*, Cassini, and I am induced to believe that it is one of the species of *lan* which the Chinese cultivate in their Southern Provinces, and which they ordinarily use to dye a light blue.

6.—*The Green Indigo of India.*

Announced by Prinsep, about 1790.

Alderman Prinsep, on his return from India, gave to Bancroft about 1790, a small piece of a hard green substance, produced in India, and which he called *Green Indigo*.

Bancroft has recorded in Volume I of *Experimental Researches concerning the Philosophy of Permanent Colours*, (London, 1813) pp. 264 to 266, the experiments to which he submitted this substance. It appeared to him to resemble, in certain points, the green fecula obtained from several plants, and especially of the *Cruciferae*, when exposed to fermentation in hot water, in the same manner as Indigo.

Bancroft had an idea that this green indigo of Prinsep was the fecula of the *tsai* mentioned by Poivre.

Here is the opinion of Mous. Persoz on the subject:—“Bancroft, being anxious to ascertain whether the substance handed to him by Prinsep was a *green fecula* that could be used to dye in green, states that having submitted it successively to the action of alcohol, water, concentrated sulphuric acid, and finally of a mixture of red arsenic and caustic alkali, after obtaining by means of alcohol, a considerable proportion of a green substance which he compares to chlorophylle, the insoluble residuum bore all the character of indigo. Treating it subsequently with sulphuric acid, he obtained the *Saxon blue*, while with sulphate of arsenic and alkali, he obtained a painting blue.” (Private letter, 4th June, 1857.)

7.—*The Green Barasat of India.*

Forwarded by R. C. Birch in 1792.

The green *barasat* was sent, in 1793, from Calcutta by Mr. R. C. Birch to Messrs. T. and F. Baring and Co., and these gentlemen requested Dr. Bancroft to examine it.

The *barasat* resembled indigo, but was of a deep green colour. It was reported to be the produce of the leaves of a perennial, exotic plant, thus described:—Leaves differing but slightly from those of the laurel; flowers small, yellow and arranged in clusters; the seeds arranged at the end of lengthy pods. This plant is, according to Bancroft, (Vol. I, p. 275) the *taroum akkar* of Marsden, which Roxburgh has described under the name of *Asclepias tinctoria*.

Birch announced that the green *barasat* imparted to silk and cloth a light green without any mordant. Bancroft came to the conclusion (after experiments) that this substance consisted of two different colouring matters; one insoluble in caustic potash, being in fact indigo; the other, olive, soluble in potash, imparting an olive and an apple green, when used as a dye. (See Bancroft, *Experimental Researches*, Vol. I., pp. 266 to 275). What Bancroft says of the *barasat*, is to a certain point, applicable to the woad. The olive green matter reminds me of the green fecula of the woad which consists of chlorophylle, a waxy matter, indigotine, and an azotized substance.

Mons. Persoz thinks the *barasat* is nothing but an impure kind of indigo. He thus writes to me on the subject: "This substance was submitted by Bancroft to numberless experiments, which ended in inducing him to believe that not only might he obtain from it all that was obtainable from indigo, but that by evaporating a portion previously reduced to powder, the result gave him pure crystals of indigotine."

If the green *barasat* is furnished as stated by Bancroft (Vol. I, p. 275) by the *Asclepias tinctoria*, Roxb., it is clear it can be nothing but an impure indigo.

Indeed the *Asclepias tinctoria*, Roxb. is very generally used as a blue dye in several parts of India, and of the Indian Archipelago, especially in Pegu and Sumatra; it is the *Masdenia tinctoria* of Robert Brown, the *Pergularia tinctoria* of Sprengel.

Marsden informs us that the *taroum akkar* contains indigo, and that it is used in Sumatra as also the *taroum* (*Indigofera*) for dyeing blue (*History of Sumatra*, 1783, p. 78). Roxburgh extracted from the leaves, by means of hot water, a quantity of indigo, considerably stronger, in his opinion, than that obtained from the *Indigofera tinctoria* (*Fl. Indica*, 1832, Vol. II, p. 44.) Bancroft himself alludes (Vol. I, p. 189,) to three kinds of this kind, prepared by Dr. Roxburgh; the first of a very beautiful violet; the second, approaching to blue, and the third approaching to purple.

8.—*Asclepias tingens* of the Burman Empire.

Mentioned by Dr. Buchanan about 1795.

Dr. Buchanan brought from Pegu to India, in 1795, the *Asclepias tingens*, Roxb. (*Gymnema tingens*,) Sprengel. He informed Dr. Roxburgh that the Burmans extracted a green colour from the leaves. The numerous and varied experiments made by Dr. Roxburgh resulted in disappointment. See *Fl. Indica*, Vol. II, p. 54, and *Bancroft*, Vol. I, pp. 275—276.

9.—*The Green Indigo*.

Examined by Kurer, in 1801.

I have not been successful in obtaining the original paper of Kurer, and therefore know it only by an abstract thereof prepared by Mons. Gustave Schwartz.

The experiments are nearly the same as those of Bancroft, though Kurer was not acquainted with the work of the latter, which was translated into German at a much later period. He came to the conclusion, that the green indigo in its deoxidized condition, was possessed of the same properties as the indigo of commerce, and that it is only a mixture of blue and of yellow substance from the plant.

10.—*Vegetable Green of China or Java.*

Sent by M. Cezard in 1837.

Mons. Nicholas Cezard, one of our most enterprising enquirers, sent, in 1837, from Batavia, to the Industrial Society of Mulhausen a vegetable green, with the simple observation that it was used in China as a dye-stuff. Mons. Gustave Schwartz was requested to examine its qualities and uses; the report read by him to the Society on the 27th September, 1837, is to be found in Vol. XI of the *Bulletin of the Industrial Society*, 1838, pp. 25 to 32.

Mons. Schwartz hesitates not to say, and his experiments support his assertion, that the vegetable green, sent by M. Cezard, was the same substance that had been previously examined by Bancroft and Kurer. He ascertained that it contained no green principle: that the green, or more properly olive green colour, was the result of the mixture of a yellow substance soluble in water, of gluten brown indigo, and blue indigo. The analysis of Mons. Schwartz yielded the following results:—

Yellow substance,	10.4
Gluten and salts,	35.3
Brown indigo,	39.2
Mucilaginous matter,	5.1
Indigo blue,	10.0
	<hr/>
	100.0

Professor Bleekrode received from Java, towards the end of 1856, a blueish green substance, believed to be the same as the *lo-kao*, but which his analysis proved to be analogous to indigo.

11.—The *Whi-mei* of China.

Exhibited in London, in 1851.

Before the *Green Dye of China*, had been discovered, before it was known or thought of, it is believed the plant

yielding it was exhibited in London by the East India Company. It is thus noticed in the official illustrated catalogue :—"The *whi-mei* of the Chinese, which is said to yield a green dye, and is produced in the Province of Chantoung" (Part V. p. 14, 20.) It attracted no attention, nevertheless Professor Solly, the reporter of Cl. IV, raises no doubt on the subject; he repeats that samples of the *whi-mei*, a green dye, were exhibited. (*Rep.*, p. 91.)

It would not be surprising to find that this *whi-mei* was either the green lac itself, or the bark of the *Rhamnus*, for the Rev. Mr. Edkins mentions that the *lo-kao*, is sent from Kia-ning-fou into the Province of Chantoung, and Father Helot asserts that the *pe-pi-lo-chou*, one of the two *Rhamni* which, it is said, do only furnish the green dye, is indigenous to the mountains of Chantoung. But Mr. Robert Fortune informs us, in a recently published work, that the *whi-mei* is the *Sophora Japonica*. He says, that, "Some persons have sent the flowers of the *whi-mei* (*Sophora Japonica*) to England, as yielding the green dye; but that flower yields a yellow dye, and even if mixed with blue to produce a green, that green would not be the one alluded to by French manufacturers." (p. 166.) This observation is quite correct. It is however, not certain, as I shall show further on, that the colouring matter of the flowering buds of the *S. Japonica* does not afford a green dye. The Chinese dyers, traders, and writers always call them *hoai-hoa*.

12.—*Green Substances sent in 1855, by the Agri-Horticultural Society of India.*

The Memo. presented by Mons. Persoz to the Academy of Sciences, attracted the attention of the Agri-Horticultural Society of India, holding its sittings in Calcutta. That body requested Mr. R. Fortune, then travelling in China, to collect and forward every information regarding the plant yielding the *lo-kao*. Mr. Fortune hastened to send seeds of the plant to the Society, who received them in 1854.

The Chamber of Commerce of Lyons reprinted the report of Mr. McMurray on the plan adopted by him for the cultivation of the two species obtained from China. This report is to be found at pp. 19 to 22 of this *Journal* for 1857.

Mr. R. Fortune forwarded further information regarding these plants, and the green dye to the Agri-Horticultural Society of India, in letters dated respectively from the Temple of Tein-tung, 30th June, 1854, from Hong-Kong, 19th March, 1855, and in 1873. The two first letters were also published by the Chamber of Commerce of Lyons (pp. 16 to 19). The third relates to information collected by the Rev. Mr. Edkins in Tche-kiang, and supplied by him to Dr. Lockhart (pp. 37 to 39.)

It is to be observed that Mr. R. Fortune did not see the *lo-kuo* prepared. He sent to the Society:—

1st.—Seeds of the cultivated, and of the wild species.

2nd.—Cuttings of the barks bought by Mr. Edkins in the district of Kia-hing.

3rd.—An extract obtained at Shang-hai by Dr. Lockhart, by boiling the cuttings.

4th.—An extract of the seed of the wild species.

5th.—Do. of the cultivated, do.

6th.—An extract from a mixture of the seeds of the wild and cultivated species. (I should mention that Mr. Fortune wrote:) “The extract of the seed of the cultivated plant is of a yellowish colour; while that of the wild kind is of a purple or violet tinge, and very beautiful. These two extracts mixed together yield a green of different shades, according to the proportions of each.”

7th.—Some paper dyed with the colouring matter extracted from both species, bought at Ning-po.

8th.—Some cloth dyed with the colouring matter obtained from the root, and bought in a town of Tche-kiang.

The Indian Agri-Horticultural Society forwarded the whole of the above samples to Mons. Persoz, in May, 1855,

and begged that learned chemist to examine them and favor the Society with his opinion. Mons. Persoz wrote to me as follows on the 4th June, 1857 :—" I went myself to London to receive these articles ; and on my return devoted myself in submitting every one of them to numerous experiments, in the hope that I had before me the organs and the extracts of the plant yielding the *green dye of China*. But great was my disappointment to find that, with the exception of the calico stated to be dyed green by the root, and which was identical with that forwarded in 1848 by Mons. de Montigny, none of those substances, not even the coloured paper, contained any of the green dye. All my attempts to elicit this dye were fruitless, you will therefore understand, my dear colleague, how much it was to be regretted that the *root* said to have been used in dyeing the calico with the genuine colour, was just the only substance that was not sent to us."

13.—*The Green Dye exhibited in Paris, in 1855.*

Dr. Forbes Røyle devoted a few lines to the green dye of China in the report which he addressed to the President of the Board of Trade, after the Universal Exhibition of Paris in 1855. There are, according to him, three kinds of *green dye of China*, or Green Indigo ; the first comes from China, the second from the Burman Empire, and the third from Assam. According to the same writer they are all obtained from Acanthaceous plants. The latter kind have been exhibited, in the Indian department, by Dr. Falconer ; it is noticed in the Jury report, with the note appended, that the green dye called in India *roum*, and the *green dye of China*, are the same substances.

A clever druggist of London, Mr. Daniel Hanbury, well known for his enquiries into the *Materia medica* of Asia, undertook to obtain information for me regarding this substance, of which I could not get any specimen, and the answer of Dr. Falconer leaves no doubt that the *roum* differs materially from the *green dye of China*.

“This green colour, named *roum* by the natives of Assam, is prepared in the valley of the Berhampooter river in Assam. It is extracted from a species of *Ruellia*, an Acanthaceous plant. This plant, the specific name of which is unknown, or a species nearly allied to it, is cultivated with the same object in Pegu, and other parts of the Burman Empire. We must not compare the *roum* with the *lilaroum*, an indigo furnished by an Apocynaceous plant, the *Wrightia tinctoria*, R. Br. Dr. Falconer is inclined to think that the green dye or *roum* of Assam contains indigo of the same kind as is yielded by the species of *Isatis* and *Wrightia*.

Some persons think this is the *Ruellia comosa*, Wall., or the *R. eucoma*, Steudel. Nothing definite can be said on this point. The *R. comosa*, Wall., is the *Ebermaiera axillaris*, De C., and the *R. comosa*, Roxb., or *R. eucoma* Steudel, is the *Butera ulmifolia*, De C. Both these plants are Acanthaceous, as well as the *Justicia tinctoria* of Loureiro mentioned above.

ABSTRACT.

Of these thirteen substances five have been examined, the others have not, and some of these are altogether unknown.

The green indigo of Prinsep, that analyzed by Kurer, the vegetable green of Mons. Cezard, are impure indigoes, possibly the same may be said of the *roum* of Assam.

The extracts sent by the Agri-Horticultural Society of India have none of the properties of the *lo-kao*.

With reference to the remark of Mr. Robert Fortune, the *whi-mei* exhibited in 1851, is either the flower of the *Sophora Japonica*, L., or a dye obtained from them. If this dye be really green, as stated in the Catalogue of Prof. Solly, it would support the singular assertion that the *hoai-hoa* may also yield a green colour, but the *whi-mei* is certainly not connected with the *lo-kao*.

The green dyes obtained from that species of *Ruellia* in Assam, from the *Justicia tinctoria*, Lour., the *Adenostemma*

tinctorium, Cass., the *Sansevieria late-virens*, Haw., the *Asclepias tingens*, Roxb., of the *Melissa officinalis*, L., of the blue flowered Scabious, have not yet been examined.

Finally the *tsai* of Poivre, the *dinh-xanh* of Charpentier de Cossigny, and the green indigo mentioned, in Cochinchina, to Mons. Hedde and myself, are still unknown.

The *green dye of China* has been sought in vain in the various plants stated to yield a green dye by several writers; the result does not appear to have been satisfactory. The plants I allude to are the *Arundo phragmites*, L., the artichoke, the deadly night-shade, wild chervil, the ash tree, *lucerne*, *Lycopersicum esculentum*, Mill., *Mercurialis perennis*, L., *Ronabea arborea*, Blanco, the groundsel and the common field clover.

III

OF THE CHINESE NAMES OF THE GREEN DYE, AND OF THE PLANTS FROM WHICH IT IS EXTRACTED.

Those only who have travelled and lived in China know how difficult it is to obtain precise information on any subject in that country; it is therefore not to be wondered at that after five years' expectation I am still without the names, written in Chinese characters, of the plants that yield the *green dye*, and no other person has been more fortunate than myself.

Mons. Arnaudtizon, a Delegate of the Chamber of Commerce of Rouen in China, wrote a letter regarding the *lo-kuo*, on the 16th January, 1853, to the French Consul at Shanghai. The date of that letter is interesting, and I have given an extract from it at the close of this notice. He states therein that the shrub is named *lo-sa*. Mons. de Montigny, Mons. Edan, his officiating successor, Mons. Remi, and Mr. Fortune, all give the same name (*lo-za*, *lok-zah*, *lo-sa*.) The Rev. Mr. Edkins, of Shanghai, is of the same

opinion ; but as he had the character before him, he wrote *luh-chae* in the Kouan-hoa dialect, and according to the English mode of transcribing Chinese words.

Lo-zai, loh-zah, lo-za or *lo-sa*, is not the name of a plant. The word *tchai*, in Kouan-hoa, and *zai* or *za*, in the dialect of Ningpo, means small faggot, or a faggot of small pieces of wood—small pieces of wood suited for burning. Father Helot assures us that :—

“The name of *lo-za*, given to this shrub in Tchakiang, is not its proper name, but the designation of its branches tied up in faggots for sale to the dyer.” (p. 24.)

Further on I shall speak of two species of two shrubs ; I do not exactly know the names by which they are distinguished in China. Father Helot is the only one who has thrown any light on this point. He mentions two species or two varieties of *lo-za* ; one is called *pa-bi lo-sa*, (white skinned green vine branch) the other *hom-bi lo-sa* (red skinned green vine branch).

Knowing the meaning, it is easy to restore the Chinese character ; the cultivated species would be in the Kouan-hoa dialect *pe-pi lo-tchai*, or more precisely *pe-pi lo-chou*, and the wild species, *hong-pi lo-tchai*, or still better *hong-pi lo-chou*.

Further on (p. 24) Father Helot says :—“The Cantonese on whose mountains this shrub grows, say it is called *lieu lo-chou* (willow green tree), and that at the commencement of winter it is conveyed in small faggots, and the name of *lieu lo-tché* (*tché* signifies small wood, branches). *Lieu lo-chou* is, therefore, I think its real name.” It is difficult to determine whether Father Helot meant to say that the *lieu lo-chou*, or more correctly the *lieou lo-chou*, is the generic name of the *Rhamni* that furnish the green dye or the name of that species of the genus that grows on the mountains of Changtoun, that is the *pe-pi lo-chou*. I incline to the first supposition.

Mr. Fortuue states that a farmer in the neighbourhood of Hong-tcheou-fou, who had some plantations of the cultivated *Rhamnus*, named it *loh-zah*, and *soh loh-shoo*. The cloth dyed with the bark was called *se lo-pou*, according to Father Helot, *soh lo-shoo* ought most probably to be written *se lo-chou*, and would then signify the *green-dye* tree, *se* (colour) being in Ning-po, pronounced *sah* and *soh*.

In a note to which I shall refer again, Mr. Ch. A. Sinclair, interpreter to the English consulâte at Amoy, mentions a bark used in Fokien for dyeing cotton green; it is in the local dialect, called *hwuy Chiang-chi*, or *lee-chi*.

I do not identify in these words the pronunciation peculiar to Fokien, and a search in the dictionary of that dialect lead me to believe they are not correct. To make sure, I asked Mr. Edgar Bowring, of the *Board of Trade*, to transcribe the letters as they appear in the original report of Mr. Sinclair. I found them to correspond with *hoa tchin-tse*, pronounced at Fokien *hoa tchim-tchi*, and *lo-se* pronounced *liok₂tchi*. The first signifies flower-needle thorn, that is the plant bearing sharp thorns and flowers; the second, green-thorn, or thorny plant yielding green. [It is almost needless to mention that the English vernacular name of the European *Rhamni* is buck-thorn.—TRANS.]

The shrubs from which the *green dye* is obtained are thorny; it is very probable that this *lo-tse* or *tchin-tse* is one of the *Rhamni* mentioned by Father Helot.

I have now to notice two names totally different from any of the above.

Father A. Aymeri, Procurator of the Mission of St. Lazarus in China, writes from *Ning-po* on the 22nd August, 1856, that a shrub, the bark of which is bought to dye for common cloths, and which grows wild in the district of Ht-tcheou is called *ma-ly*, in the province of Peking. He does not give the Chinese characters.

Dr. W. Williams mentions a plant named *ma-li-kin*, which should be the *Asclepias curassavica*, Lour. (*Toxicarpus Wightianus*, Hooker.) It has been stated above that indigo is extracted in Sumatra from the *A. tinctoria*, Roxb., and that in Pegu, the *A. tingens*, Roxb., yields a green dye.

I received from Mons. Remi, in September, 1856, a recent sample of the green dye of China, with a label, on which was written, "Green Paste of *Sou*." It differed in no respect from the previous despatches. Medhurst gives *clary* as the translation of *sou*, and Mons. Callery translated it *Scrophularia*. Mons. Decaisne told me that an English horticulturist had reared a scrophularious plant, which had been sent him as the *lo-za*.

Mons. Carvalho sent the 258 taels of lac intended for Mons. Guinon, under the name of *lok-kouh*. Messrs. De Montigny, Edan, Arnaudtizon, Remi, Father Helot and Aymeri, all call this substance *lo-kao*. The Rev. Mr. Edkins and Mons. Remi caused the character to be written, the first at Kia-hing-fou, the second at Shanghai; the name was not written in the same manner, but the difference was slight.

If we adopt the characters given by the Rev. Mr. Edkins, and Mons. Remi (letter of the 7th January, 1857,) the *green dye of China* is called *lo-kiao*, which signifies green glue, or green lac. Depending on the second writing, also sent me by Mons. Remi (Sept., 1856,) we have it green juice, green fat, green paste. I may add that it has also been written *lo-kao*, *lou-kao*, (*Travels of Morrison, Williams, &c.*) which explains how Mr. Edkins comes to write *luh-kaou*, and Mons. Remi *low-kou*. I give the pronunciation of Kouan-hoa; in Canton it is *louk-ko*, in Fokien, *liok-kou*, and *lek-ko*.

M. de Grijjs, who forwarded from Amoy, to Dr. D. Hoffman, his former master, a Dutch translation of the paper of Father Helot, writes the equivalent to green cake, relying

on the opinion of Dr. Williams. I surmise the real name is *lo-kao*.

The *lo-kao* purchased at Canton in December, 1852, was divided into packets each containing 10 taels (378 gr.); these packets bore a label. It was supposed to convey some useful information, or at least the name of the lac and of the plant. Nothing of the kind. Here is the inscription:—

On the left: *Ting-chang, youen-tsai kiao tsoui-mao lo chiliang tso*, signifying “ten ounces (Chinese) exact weight, of fine green (colour) of feathers of the (bird) *tsoui*, natural colour of the best kind.”

On the right: *king-jen kien-siouen*, “selected with care to dye figured silks.” The name and sign of the seller are on the left: *Ta-sin tsai-yun*. —

IV.

OF THE PLANTS THAT YIELD THE GREEN DYE OF CHINA.

Until some European chemist shall have discovered traces of the green dye in some of the parts of the plants I am about to treat of, the flowers, the berries, the seeds, the leaves, the bark, or the root, it cannot be asserted that these plants are really those the Chinese use to dye their cottons with, or from which they prepare the *lo-kao*. The doubt is reasonable, when we consider the numerous contradictions that pervade the items of information collected in China by the most trustworthy persons, and how the most distinct assertions disagree with the facts ascertained by science and the arts. I repeat that in China one can only believe what one sees. A Chinese never confesses that he does not know; and he makes a point of producing any article required of him. He discourses on what he knows nothing of with the same effrontery with which he sells the Schweinfurt green as the green dye of China, and Prussian blue for indigo. The testimony of the Chinese can therefore only

be received after a careful examination, unless some dependence can, from previous experience, be placed in those from whom information is sought.

The discovery of the shrub that yields the green dye is due to Mons. de Montigny; it must have been made before the year 1852.

Mons. Decaisne found several specimens of the *Rhamnus chlorophorus* in the herbarium of Miss de Montigny. The branches bearing seeds not perfectly ripe must have been gathered in August or September, and as Mons. de Montigny embarked with his family at Whampoa for France in July, 1853, the shrub must have been in his possession during the later months of 1852.

I learn from Mons. Remi that Mons. de Montigny had several plants in the Consular Garden at Shanghai; but I cannot say when, but it must have been before 1853, and may have been in 1852, for Mons. Remi writes in terms that prove him to have seen what he writes about: "The *lo-za* grows somewhat rapidly, and attains in three years a height of from 5 to 6 feet."

Finally, before leaving China, Mons. de Montigny forwarded in cases to the Museum of Natural History, a number of plants of both species, which were unfortunately dead when they reached. Father Helot mentions them:—"The shrubs sent by Mons. de Montigny may be considered genuine, amongst the plants transmitted are the *hom-bi* and the *pa-bi lo-za*."

Whatever may be the date, Mons. de Montigny is the discoverer, and made these *Rhamni* known to Mr. Fortune. This priority need surprise no one: our Consul has rendered many other services, and his intelligent enquiries and indefatigable zeal are well known.

Mons. Persoz shewed me, in April, 1852, the vegetable green lac which he had just received; I immediately wrote to Canton for seeds of the plant from which it was obtained.

None were to be had. I wrote to Shanghai in October 1852.

On the 9th July, 1853, Mons. Remi wrote to me from Shanghai on the subject :—" I will speedily send you some seeds of the shrub that yields the green dye."—Mons. de Montigny had one of them in his garden ; he gave it to Mr. Alcock, British Consul. It is now covered with berries, when they are ripe I will ask Mr. Alcock for some. . . Mons. Edan assures me that there is another tree of the same genus, named *lo-za*, in the garden of Mons. de Montigny, of which he took possession with the Consular office. That tree is also loaded with berries."

Mons. Remi sent off the seeds on the 29th November, 1853. He wrote :—" Mons. Edan and myself have gathered these seeds, and we have extracted the green indigo of which we send you the extract." He adds further on :—" I believe the *lo-za* will grow rapidly in France ; and that large plantations would yield a profitable return to any undertaking the cultivation. The tree bears numerous branches ; it grows rapidly, and in three years attains a height of 5 or 6 feet. The berries are abundant ; a single tree will yield enough to make half a kilogramme of indigo."

Finally, Mons. Edan wrote on the 10th December, 1853—:

" I gave Mons. Remi a part of the gathering (of the berries of the *lo-za*) secured in my garden."

This is the history of the seeds I received in January, 1854. I gave a portion to my sister-in-law, Madame Bizot-Desgrand, of Lyons, and another portion to my friend Mons. de Montigny, who was then at Paris, and who presented them on the 13th April, 1855, to the Imperial Zoological Society of Acclimation. The Society handed the seeds to Mons. Paillet, but none of them germinated. The other seeds were sown, in February, 1854, at Tassin, near Lyons, by Mons. P. Desgrand ; they germinated, and some fifteen plants are still in existence, having weathered three winters. 6

The plants that have flowered this year at Irigny, with Mons. A. F. Michel, were obtained from Tassin, as also those in the Botanical Garden of Lyons.

Mons. Arnaudtizon considered (in January, 1853) that two species of *lo-chou* were in use. He says:—"The colouring matter is obtained from a tree of which there are two kinds, one produces what is called in Chinese the *yellow skin*; the other the *white skin*." He adds that this tree is only to be found near Sou-tchou and Kachin, in marshy land. The Rev. Mr. Edkins also indicates two species; one called a *white* variety, is wild, and grows in abundance in the vicinity of Kia-hing and Ning-po; the other, the yellow variety, is cultivated, and is to be found at Tsoh-kaou-pang, where some thirty men are employed in the preparation of the dye-stuff.

Mons. Fortune secured the wild and the cultivated species; he sent plants of both from China to the Agri-Horticultural Society of India, who received them in March, 1854; he subsequently brought both the same species to England.

Father Helot confirms the assertion, by saying: "The *lo-za* is of two kinds, which may be only varieties of the same species. One is from the bare mountains in the S. E. of Tché-kiang (in Chantoung) and named *pa-bi lo-za*; the other which is a shrub, and grows wild in the fertile plains around Azè, in the same Tché-kiang, is called *hom-bi lo-za*." When the bark of this latter species is boiled in water, a white scum is formed that subsequently passes to rose. "It is this peculiarity," says Father Helot, "that has obtained for it the name of *hom-bi*, red (scum) bark." However long the bark of the other may be boiled the same remains white; hence the name of *pa-bi*, white (scum) bark.

Father Helot does not agree in this respect with the Revd. William Edkins and Mons. Arnaudtizon. Red bark is said to be *hong-pi*; yellow bark *hoang-pi*, or as commonly

pronounced *houong-pi*; the difference between *hong-pi* and *houong-pi* is so small that it is easily accounted for. The *pe-pi lo-chou* is, according to Father Helot, the cultivated species, and the wild species according to Mr. Edkins. The same discrepancy exists between them in regard to the *hong-pi* or *houong-pi*. Mr. Fortune agrees with the English missionary.

Mons. Remi wrote to me on the 6th September, 1855; "There are certainly two kinds of *lo-za*, but I believe that only one, and that the one you possess, yields the green indigo." Mons. Remi explained more recently in August, 1856, that the name of *lo-za* is applied to two varieties, to the *male lo-za* and the *female lo-za*; that the barks of the two are mixed together to dye silk and cotton green.

Messrs. Arnaudtizon and Fortune, the Rev. Mr. Edkins, and Father Helot, also intimate that the two species are necessary to the production of the green dye. "The solution of *hom-bi lo-za*," says the latter, "yields a stronger and more firm tint, but without lustre, while the solution of the *pa-bi lo-za* affords a light tint without strength, but with a magnificent glance. The operation of preparing the colour commences with the *hom-bi*, and it is completed with the *pa-bi*, and thus do the Chinese make their most valuable colour."

If there be one fact beyond a doubt, it is that there are two species of *lo-chou*. It is established by learned persons who have seen them, and the remarks have been made at different times and different places. But these observations, when compared with each other, and with the remarks addressed to me by Sir W. J. Hooker, Dr. Lindley, Messrs. Fortune, Remi and Hانبury, exhibit contradictions, some of which have already been noticed.

With these reservations, I will now state how I came to collect facts sufficiently authentic to enable Mons. Decaisne of the Academy of Sciences, to describe these two species.

The illustrious Professor of the Jardin des Plantes has on the other hand, owing to the great care devoted by him to all his enquiries, arrived at proofs of a distinct and original character, that have confirmed my own.

Father Helot caused a branch of the *hong-pi lo-chou*, covered with green berries, to be drawn from nature by a Chinese artist; the Central Committee of the Society for the Propagation of the Faith communicated this water-colour to the Chamber of Commerce of Lyons; and its members committed it to my care. The authenticity of this drawing is incontestable; it bears the seal and signature of the artist *Lao-san, i-kien, tchi* (Lao-san, surnamed Kien, did it;) the plant is expressly stated to be the *hong-pi lo-chou*.

This was my starting point. I was so fortunate as to secure proofs of the accuracy of this painting.

Father Helot had made arrangements for sending fifty pounds of seed to the Central Committee. The despatch never reached its destination; but, in the month of January, 1857, Father Aymeri forwarded from Shanghai, to Mons. E. Tastet, a large quantity of black berries, which on account of their appearance, and the number of thorns mixed with them, were evidently the produce of this species. This despatch is probably that originally prepared by Father Helot.

I received myself from Shanghai, in April, 1857, similar berries accompanied as they were by thorns. Those painted by the Chinese artist resemble these thorns as to apparent strength, hardness, sharpness, and length.

Dr. W. Lockhart sent from Shanghai to Mr. Dan. Hanbury some branches said to be taken from the cultivated species of *lo-chou*: they belonged to that *Rhamnus* which Mr. Fortune also states to be cultivated, and of which he brought several plants to England. These plants are in the garden of Dr. Lindley at Acton-Green, and in that of Mr. Glendinning, nurseryman, of Turnham-Green.

Mons. Decaisne examined the leaves forwarded to me by Mr. Hanbury; they correspond with those of the *hong-pi lo-chou* drawn by Lao-san. Mons. Van Houtte, the celebrated horticulturist of Gand, has reared, on the other hand, a *Rhamnus* sent to him as the one yielding the green dye; and Mons. Decaisne has been able to declare that it differs, in no respect, from that of Father Helot.

The *hong-pi lo-chou* has all the characteristics of a wild shrub; and, of the two species, this one must be considered as the one growing without cultivation. This is the opinion of Mons. Decaisne; it is that of Father Helot; and we must believe that both Mr. Edkins and Mr. Fortune have been misled. With this reservation, their accounts agree with what we have said regarding this species. The *hong-pi lo-chou* is truly very strong and vigorous, as remarked by Mr. McMurray when writing of the cultivated species, and Mons. Persoz has obtained from the berries, as Mr. Fortune did, a fine yellow dye; but I am bound to notice that Father Helot, writing on the 27th April, 1857, on the subject of the *pe-pi lo-chou*, observes in a P. S.:—"This shrub is not cultivated," while he said in his paper on the *green dye*:—"The *hom-bi lo-sa* grows as a shrub and without cultivation." We shall shew hereafter which of these two is the correct definition.

Mons. Decaisne has, under the name of *Rhamnus utilis*, described this species, which is allied in the size of its leaves to the *R. hybridus* of our gardens (see pl. 1). .

"*Rhamnus dioicus*; ramulis cylindraceis, spines centibus vel inermibus; foliis 8-10 centim. longis, 3-4 latis, oppositis alternis ve, elliptico-oblongis, apice obtusis aut acuminatis, basi parum attenuatis, margine denticulatis et ciliolatis, subtus puberulis, penninerviis, nervis pagina superiore impressis, inferiore prominulis; baccis magnitudine pisi majoris; nuculis obovodeis, compressis, longitrorsum sulcatis, opacis."

The *hong-pi lo-chou* being known, it is evident that the other species sent us must be the *pe-pi lo-chou*. Mons. de Montigny possessed both species, he sent them both to the hot-houses of France, but they were found dead on arrival; there remained only in his garden, at Shanghai, that other species which was not the *hong-pi lo-chou*, the one which according to every testimony was necessary in the preparation of the green dye. It is merely called *lo-za* or *lo-chou*; it must certainly be the *pe-pi lo-chou* of Father Helot, and what he says on the subject in his letter of the 6th of April, 1857, decides the point.

I draw especial attention to the fact, stated by the Chinese, that to this shrub is due the most singular attribute of the green dye, viz., its brilliancy when exposed to artificial light. Father Helot speaks of the magnificent lustre obtained only after immersion in the infusion of the *pe-pi lo-chou*. At Azè he was assured that the *lo-kao* was prepared from the bark of the *pe-pi*, and the dyers of Khiutcheou-fou, whom this zealous missionary interrogated, described a process for dyeing silks and cotton with the *pe-pi* only. It would seem, in fact, if one might place any dependence on the somewhat obscure statements of the Chinese, that the *pe-pi* alone yields violet, blue and green, according to circumstances, and a peculiar kind of *lo-kao*, on cloth of a watery green tending to azure, with lime or alum; that the *hong-pi* yields a yellow to impart a green to the color, and that the *lo-kao* is impure if the admixture of this yellow be in too great a proportion.

I have introduced the *pe-pi lo-chou* into Europe. I twice received seeds of this plant. I gave some of the first despatch to Mons. de Montigny and to Madame Bizot Desgrand, and of the second to Mons. Decaisne, to Sir J. W. Hooker, and to the Messrs. A. F. Michel, Scringé, Paillet, Hanbury, Bleckrode and Van Houtte.

Mons. Remi had sent me, some short time before, a branch covered with unripe berries; a drawing was prepared from this branch, and fragments of it are still in existence. Subsequently, Mons. Mollien, French Consul at Havanna, on his return, in January or February, 1854, from a Journey to China, brought some specimens of the same *lo-chou*; they had been gathered carelessly, and were in a bad condition.

In the meantime, the seeds sown in Lyons in February, 1854, had germinated, and some twenty shrubs were growing in the open air, on a hill side, exposed to the wind. They all flowered in the early part of May, 1857. Mons. Decaisne described the species from a branch in flower gathered on the 19th May, by Mons. A. F. Michel, from the plant he had reared in April, 1856, at his country-house at Trigny, near Lyons. Mons. Decaisne not only examined the seeds of both despatches, the shrubs reared from those seeds, the branches sent in 1853 and 1854, but he found several excellent specimens in the herbarium of Mlle. Montigny. He could have no doubt on the subject.

In noticing as mentioned above, that Mr. Fortune must have been misinformed as to the distinction between the two species, I must observe that the remarks of Mr. McMurray, regarding the wild shrub, are applicable to the *pe-pi lo-chou*: it has smaller leaves, and a more delicate habit than the other. Mr. Fortune has extracted from the berries a purplish or violet dye of superior quality; it will be seen further on, that the fruit of the *lo-chou* in the garden of Mons. de Montigny (in Shanghai) yielded a very rich green substance to Messrs. Edan and Remi.

The *pe-pi lo-chou* is now the *Rhamnus chlorophorus* of Decaisne (see Pl. II.)

“*Rhamnus dioicus*; ramulis cylindraceis, cinereis, apice spinescentibus et pube brevi inspersis; foliis 3-4 centim. longis, 2-3 latis, alternis oppositisve, breviter petiolatis, ovatis, acuminatis, basi cuneatis, denticulatis, subtus pæberulis,

supra glabris, nervis in pagina superiore impressis, in inferiore prominulis; stipulis lineari-setaceis membranaceis; floribus masculis binis v. quaternis; calycis tubo infundibuliformi, laciniis lanceolato attenuatis, reflexis, vix puberulis; petalis obovatis, membranaceis, stamina longitudine subæquantibus; ovarii abortivi stylis binis obtusis; baccis nigris, globosis, magnitudine pisi minoris; nuculis obovoideo-rotundatis cylindraceisve, dimidio inferiore sulcatis, nitidis."

It may be remarked of these two new species of *Rhamnus*, and perhaps to others, that according to localities the extremity of the branch is thorny or otherwise, and that therefore characters deduced from the existence or absence of thorns are of very small consequence in describing species. The branches of the specimens of the herbarium of Mlle. Montigny are armed at their extremities with long hard and sharp thorns, while the thorns on the plants reared at Lyons are hardly noticeable.

Finally, it is established that the *hong-pi lo-chou*, (*Rhamnus utilis*), is, according to Father Helot, the wild species, and according to Messrs. Edkins and Fortune, the cultivated species; and the *pe-pi lo-chou* (*Rhamnus chlorophorus*), is the wild species of Messrs. Edkins and Fortune, and the cultivated plant of Father Helot.* The first has been introduced by Mr. Fortune, the second by myself.

The Chamber of Commerce of Lyons has inserted in its second publication a note addressed to them by me on the origin of the seeds of the *lo-chou* reared at Lyons. An error slipped into that note which I hasten to correct, at page 39, line 21, for *Rhamnus Sinensis* read *R. tinctorius*. There is no *R. Sinensis*. Mons. Decaisne expressed his belief on first examining it, that the branch belonged to a closely allied

* Dr. Lindley thought at first sight that the *hong-pi lo-chou* was the *R. cornifolius*, of Boissier and Hohenacher, but he has given up that opinion since the plant has been described by Mons. Decaisne; but he still believes that the *R. chlorophorus*, Deene, is identical with *R. globosus* of Bunge.

species, described by Waldstein and Kitaibel under the name of *Rhamnus tinctorius*, without being able to decide unless he saw the flowers whether it was a variety or a new species. I write now with the letters, written in 1854, by Mons. Decaisne, before me; subsequent facts have proved the correctness of his surmises. There is in the Jardin des Plantes a very handsome *R. tinctorius*, and it will be seen how much it resembles the *R. chlorophorus*, the latter differing only in the shape of the calyx.

M. Seringe has described the *hông-pi lo-chou*, from the drawing of Lao-san, under the name of *Rhamnus Sinensis*. I must bring to the recollection of my readers that it has been named *R. utilis* by Mons. Decaisne.

Are the two buck-thorns of which I have been writing, the only ones that yield the green dye? The Chinese declare that other species of the same genus have dyeing properties.

I do not mention various plants, known and unknown, which are asserted by some persons, without sufficient proof, to be the genuine *lo-chou*.

V.

OF THE LOCALITIES TO WHICH THE LO-CHOU IS INDIGENOUS.

Every thing leads to the belief, though it cannot be asserted, that our two buckthorns are those whose introduction is so very desirable. It is therefore proper to consider the climate most suitable to their cultivation.

The *houong-pi lo-chou* grows in the fertile plains in the neighbourhood of Azè, in the Tché-kiang (Father Hclot); the *houong-pi lo-chou* is found at *Tsou-kaou-pung* (Revd. Mr. Edkins); the *ma-li* is very common in the hills of the district of Hi-tcheou (Father Aymeri.) Those three localities refer to the wild species.

As for the cultivated species it abounds in the mountains of Khin-tcheou-fou, in those of the S. E. parts of Tchékiang

and of Chantoung (Father Helot); in the vicinity of Hang-tcheou-fou, of Kia-hing-fou, and of Ning-po (Revd. Mr. Edkins). Father Helot observes that the faggots of the *pe-pi lo-chou* are brought to Azè from a distance of upwards of 40 leagues, which does not agree with the assertions of Mr. Edkins, and of the dyers of Khin-tcheou-fou.

Others state that the *lo-chou* (without specifying the particular kind,) is found in the neighbourhood of Sou-tcheou-fou and of Kachin in the marshy lands (Mons. Arnaud-tizon); near Tcha-fou-pân (Mons. Edan), at Sou-tcheou and at Amoy (Mons. Carvalho), at a short distance from Sou-tcheou (Mons. Remi), and between Hang-tcheou-fou and Hou-tcheou-fou. Finally, the *lo-tsé* mentioned by Mr. Sinclair, grows in abundance at Tung-chun-chow in the Fokien province.

It is necessary to determine to which of the two species the *lo-tse* just mentioned belongs. The only hint supplied by the note of Mr. Sinclair is as to the price: he says large quantities of bark are purchaseable at 5000 sapeques the picul, or about 46 francs for 100 kilogrammes. This is precisely the price of the *pe-pi lo-chou*. At Azè the *hong-pi lo-chou*, made into faggots, is worth about $8\frac{1}{2}$ fr. per 100 kilogrammes; and the *pe-pi lo-chou* about $24\frac{3}{4}$ fr. As it is understood that 100lbs of faggots yield about 50lbs of bark, we must double the above prices, as the value of the bark, viz., 17 francs the 100 kilogrammes for the bark of the *hong-pi lo-chou*, and $49\frac{1}{2}$ francs for the *pe-pi lo-chou*. It is reasonable therefore, to suppose, that the latter is the shrub cultivated at Tungchun-chow.

But there is no district of this name in the province of Fo-kien nor in any part of China. It must therefore be an error of the press, and we must read Young-tchun-tcheou. This district is in the southern part of Fokien.

Thus the *pe-pi lo-chou*, or *Rhamnus chlorophorus*, is found to be cultivated between the 25th and 36th degrees of

North latitude, and more especially about the 30th and 31st degrees of North latitude.

The *hong-pi lo-chou*, or *Rhamnus utilis*, is mentioned as high as the 39th, and extends to the 30th degree of Northern latitude.

This buck-thorn seems, in fact, much stronger than the first, and to be able to resist the severe frosts of Tchi-li.

It is evident that both species exist in abundance in the Northern parts of the province of Tché-kiang, over a space of about 15 square leagues, of which I will define the limits. Barrow had observed on the banks of the Sihou lake, buckthorns mixed with roses, cotton plants, lilacs, junipers, &c.

Ning-po, chief town of the district of that name, in the province of Tché-kiang, one of the ports opened to foreign trade, is in N. lat. $29^{\circ} 55'$, and E. long. $119^{\circ} 6'$. Kia-hing-fou, also the chief town of a district, and in the same province, will be found in N. lat. $30^{\circ} 53'$ and E. long. $118^{\circ} 13'$. Tsoh-kaou-pang is distant two or three miles from Wang-tien, and that little town is some miles south of Kia-hing-fou, "It is in the neighbourhood of Tcha-fou-pan," writes Mons. Edan, "that the *lo-za* is most abundant," and, according to him, Tcha-fou-pan is a large borough, almost entirely inhabited by Christians, situate in the province of Tché-kiang, 70 leagues from Shanghai. There must be some error in specification of this distance, and if the Tcha-fou-pan of Mons. Edan be not the Tsoh-kaou-pang of Mr. Edkins, it must be close to it. Father Helot in alluding to a large assemblage of Christians in the neighbourhood of Azè no doubt intends to speak of this place. Azè, is a large township, six or eight leagues to the south of Kia-hing-fou, which would place it between the town of Hai-ning and Hai-yen, both of them chief places of districts, the first in N. lat. $30^{\circ} 28'$ and East long. $118^{\circ} 6'$, the second in N. lat. $30^{\circ} 35'$ and East long. $118^{\circ} 20'$. The correct name of Azè is

probably Hai-tsui. Hou-tchaou-fou is in N. Lat. $30^{\circ} 53'$ and E. long. $117^{\circ} 36'$, and Hang-tcheou-fou in N. lat. $30^{\circ} 20'$ and East Long. $117^{\circ} 48'$; both are chief towns of districts in the Province of Tché-kiang. Finally, Sou-tcheou-fou, chief town of a district in Kiang-sou, is in North lat. $31^{\circ} 23'$, and East long. $118^{\circ} 9'$.

This small tract is therefore confined within lat. $31^{\circ} 23'$, Northwards and $29^{\circ} 55'$ Southwards, and Long. $118^{\circ} 20'$ Eastward, and $117^{\circ} 36'$ Westward.

It is without doubt the most interesting district in China as far as Lyons is concerned. The most celebrated mulberry nurseries, the filatures, mills, and manufactories are to be found in these departments of Hang-tcheou and Hou-tcheou. The latter furnishes raw and organzin silk of the greatest value in the Empire, namely those of Nan-tsin or Hou, divisible into three classes well known at Lyons: the *tsi-li* or *tsat-lee*, the *yunc-hoa* or *yune-fa* (garden-flower) the *ta-tsan* or *tay-saam* (large silk-worms).

Here are the direct distances between Shanghai and each of the above towns. I calculate by *lis*, and 10 *lis* are equal to a league:—

From Shanghai	to Sou-tcheou-fou,	100	lis.
„	„ to Kia-hing-fou,	115	„
„	„ to Hai-ning-hien,	165	„
„	„ to Hou-tcheou-fou	190	„
„	„ to Ning-po-fo,	215	„
„	„ to Hang-tcheou-fou,	225.	„

Kia-hing-fou is 62 *lis* from Haining, and 145 *lis* from Ning-po. Hang-tcheou-fou is only 90 *lis* from Ning-po.

The climate of this most fertile part of the provinces of Tché-kiang and Kiang-sou assimilates with that of the south of France; the following are cultivated there:—the mulberry, the vine, the peach, the orange, the jujube, the almond, the plum, the camphor, ebony, hemp, sugar-cane,

wheat, rice, sesamum, tobacco,* &c. It is certain that the two species of *Rhamnus*, of which one can bear the climate of the latitude of Pekin, and the other is found in the mountains of Chantoung, would be perfectly at home in France.

VI.

THE OTHER SPECIES OF RHAMNUS THAT HAVE BEEN DISCOVERED IN CHINA.

The bark and the fruit of the buck-thorns have recently been the subject of much enquiry, and it will not be out of place to point out all the species that are indigenous to China. The number is small, and several will have to be referred to the genus *Zizyphus*.

Rhamnus crenatus, of Siebold and Zuccarini; Hab. Japan, (Hoffmann and Schultes. *Asiat Journ.* 4th Series, Vol. XX, p. 323.)

R. globosus, Bunge; North China.

R. lineatus, Lour. *Berchemia Loureiriana*, Decand; China. (Osbeck, *Voy. to China*, 1771, Vol. I, p. 353; fig. 7; Vol. II, p. 345,) Cochinchina (Lour. Vol. I, p. 159.)

R. theezans, Linn. *R. thea*, Osh., *Sagaretia theezans*, Br.; China (Osbeck, Vol. I. p. 375, and Vol. II, p. 245, *Account of China*, Vol. III, p. 355.)

R. agrestis, Lour., *Zizyphus agrestis*, Schultes; Cochinchina (Lour. Vol. I, p. 158; *Dict. Anam.* Latin, p. 633.)

R. ænoplia, Linn., *Zizyphus ænoplia*, Miller; China. (Osbeck, Vol. I, p. 386, and Vol. II p. 345.)

R. Soporifer, Lour. *Zizyphus soporifera*, Schultes; China. (Lour. Vol. I, p. 158, *Account of China*, Vol. III, p. 355.)

To this list have to be added:

* All, with two exceptions, cultivated in the more temperate parts of the Punjab.—TRANS.

Rhamnus utilis, Decne. ; *R. chlorophorus*, Decne. ; a new species allied to *R. chlorophorus*, in the herbarium of Mlde. de Montigny (*R. bapticus*, Decne.)

Lastly, Plukenet describes three buck-thorns, indigenous, one to the island of Tow-whey-san, and the other *R. Cheusanensis*, of the island of Tchou-san, which, in his opinion, somewhat resemble the *R. catharticus* of Linn., the third is the *R. sinensis flore cæruleo*, of the island of Tchou-san (*Amalthæum bclanicum*, 1705, p. 182. pl. 408, figs. 2 and 4. p. 183.)

VII.

OF THE PARTS OF THE LO-CHOU THAT YIELD THE GREEN DYE.

It is still not positively known whether the *Lo-kao* is obtained from the bark, the fruit, or the root ; nevertheless we have much reason to believe that it is extracted from the bark of the branches, and no doubt also from the bark of the roots.

Flowers and Leaves.

Mons. de Bourboulon wrote from Macao on the 21st August, 1852, to the Minister of Foreign Affairs :—"The Chinese who obtained this lac for Mr. Forbes, assured him that it was the produce of the flower." Mons. Carvalho, of Canton (26th November, 1852), says :—"This dye-stuff, extracted from the flower and the leaf of a certain shrub, comes from Amoy and Sou-tchou-fou in very small quantities." Information to the same effect was given to the Commercial Delegates at Canton.

Roots.

The Agri-Horticultural Society of India sent to Mons. Persoz a sample of Chinese green cloth, "dyed with the colouring matter obtained (according to the Society) from the root." Mons. Persoz ascertained that this cloth did derive its colour from the *Green Dye*.

Bark.

According to Mons. Arnaudtizon, the bath employed to dye dark green, is a hot infusion (in lime water) of the peeled bark. The Rev. Mr. Edkins collected information at Kia-hing-fou. He says: "The barks of the two species are thrown together into iron kettles full of water; it is boiled for some time; the decoction is allowed to settle for three days; it is then poured into large vessels, and the cotton cloths, previously saturated in lime water, are then repeatedly dipped."

Father Helot has in his Memoir recorded these several details of the operation. At Azè the bark of both kinds are used, but they are not mixed. "The dyeing of cloth is effected by dipping it from seven to ten times in the solution of the *hom-bi*, and the work is completed by three immersions in the solution of the *pa-bi*, drying the cloth every time." The object is that of securing *lo-kao*. At Khin-tcheou-fou, it appearst hat cloth is dyed by means of the *pe-pi lo-chou* only.

Father Aymeri, writing of the process in use at Tchi-li and Mons. Sinclair describing its nature at Amoy, only mention the bark, and Mr. Fortune wrote to Calcutta:—"It is a first step to have obtained the plant; a second to know that the dye is obtained from the bark."

The Fruit.

"The green colour is not made from the seed, which is a small black berry, but if crushed on some white paper, it stains it green. At Azè, the seed is not used at all." (Father Helot). "The seeds of the *lo-za* are of no use." (Ibid, letter 6th April, 1857.)

The following is the opinion of Mons. Edan:—"The fruit or berry (of the *lo-za*) in which the seed is enclosed, affords the precious indigo used by the Chinese to dye their cloths a fine sea-green colour." (10th December, 1853.)

About the same time (the 29th November, 1853) Mons. Remi wrote to me as follows:—"They told us (Mons. de

Montigny and himself) that the green indigo was extracted from the bark of the tree, while in truth it is obtained from the small fruit of the tree resembling the fruit of the wild vine. Mons. Edan and myself have gathered this fruit, and have extracted the green indigo, of which I send you a sample."

I should state how Mons. Edan and Remi prepared this substance, that appeared to them "a magnificent green." They first removed the skin and the seed of the berry; the fruit was then pressed to obtain its juice; this was boiled to concentration. Mons. Remi adds:—"The Chinese, after having boiled the juice, spread the paste thus obtained on some paper, and expose it to the sun to dry."

The subjoined extract from a letter of Mons. Remi dated, the 14th March, 1854, is not less interesting:—"Mons. Edan and myself obtained a very fine green from the fruit of the *lo-za*; but were unsuccessful in regard to the bark we have therefore been induced to think that the sole mode of preparation of the green dye from the fruit is the only practicable one. But Mons. Edan has recently seen the celebrated English naturalist, Mr. Fortune, to whom Mons. de Montigny had mentioned the qualities of this plant, and who had obtained from the Chinese in the interior certain information that corresponded with that originally furnished: Mons. Edan took advantage of the visit of Mr. Fortune to express his doubts of the real origin of the green indigo. Mr. Fortune assured him that the bark of the *lo-za* was truly employed to furnish the stuff with which to dye cloth green, but that the fruit was used in the preparation of a green paint.

Mons. Remi writes again on the 6th September, 1855:—"The bark of the male and of the female *lo-za* yield the true green for the dying of textures, and the fruit affords the green colour that is used for painting both in oil and water colours."

“The Chinese, according to Mr. Fortune, were agreed in telling him that the seeds were used for staining paper only, and silk and cotton stuffs were dyed with the bark.” Lastly, according to a memorandum received from China by Messrs. Chartron, father and son, and Monnier, of Lyons, and which they communicated to the Chamber of Commerce, the best kind of *lo-kao* is made from the berry, and the inferior kind from the leaf or the bark.

All the experiments made to this day, with the bark and the leaves of the *Rhamnus chlorophorus*, and the fruit of the *R. utilis*, have not been decisive.

Mons. Persoz has extracted a yellow dye from the bark of the *Rhamnus chlorophorus*, and the berries of the *R. utilis*. I do not know the result of the experiments of Mons. Barreswil on the green matter extracted at Shanghai from the fruit of the *R. chlorophorus* by Messrs. Edan and Remi. It will have been noticed above that Mons. Persoz could not discover a trace of the green dye in the extracts prepared from the berries of both kinds, and sent to him by the Agricultural Society of India.

If we are to receive the united testimony of Fathers Helot and Aymeri, Messrs. Arnaudtizon, Edkins, Fortune and Remi, we must believe it is the bark of the *Rhamnus chlorophorus* and *utilis*, but especially of the former, that gives to the green dye that brilliant colour it assumes under the influence of artificial light. The fruit, at least that of *R. chlorophorus*, probably yields a green colouring matter, analogous to the bladder-green, and differing from the true green dye both in colour and properties.

The berries, the leaves, and the bark of numerous buckthorns have been submitted to numerous experiments; some of those recently made have had singular results. The fruit of three of them has been long used in dyeing.

* Mons. Michel has obtained tolerable greens, not however improving by artificial light, from the berries of the *Rhamnus*

catharticus, L., and those of *R. alaternus*, L. His attempts to dye according to the Chinese methods with the barks have not been altogether unsuccessful, and have led to a discovery opening a new path to further investigations: the cloth taken out of the bath with a light nankeen dye, placed at night on the grass had assumed towards morning, and long before it was exposed to the rays of the sun, a deep green colour. This tint has the singular property of shewing itself on the upper side of the cloth, while the lower next the grass, though exposed to a free circulation of air, was scarcely coloured, has a reverse so strongly distinguished as to present in the piece the appearance of having been printed. A damp atmosphere and dew increase the intensity of the tint. Mons. Michel proceeded with his experiments. After steeping two pieces of cloth in a bath of the bark of the buck-thorn, he spread one in a cellar impervious to light, and left the other during the night on the grass; on the following morning he found the first unchanged, while the second was deeply coloured on its upper surface.

The fruit of a buck-thorn yielded a pretty lilac on silk under the hands of Mons. Persoz.

The green berries of the *Rhamnus infectorius*, L. (Avignon berries), of the *R. saxatilis*, L. (Persian berries), of *R. alaternus*, L., and *R. amygdalinus*, Desf., afford a yellow color. The fruit of the *R. frangula*, L., a very common shrub about Lyons, and there called *bourgener* or *bourdaine*, gathered before they are ripe, in July and August, yield a fast and brilliant yellow, according to Dambourney and Leuchs, green, according to Buchoz, and when they are ripe, in September and October, they dye a purplish-blue without any mordant, and green, violet, blue-violet, or blue, according to the nature of the mordant employed. Dambourney obtained on wool, from the juice of the ripe berries fermented, very fine and fast greens, varying from an apple to a dark green. The colouring matter of the berries of the *R. infectorius*

as yellow before they are yellow, and a dark purple red, as soon as they have attained maturity. Buchoz notices a similar peculiarity in the fruit of the *Rhamnus catharticus*; before ripening it yields a saffron-red; after maturity a green, known as bladder-green, and still later a scarlet. The green berries of *R. tinctorius*, have, according to Waldstein and Kitaible, dyeing properties similar to those of the fruit of *R. catharticus*, but more esteemed by the dyers.

The inner bark of *R. infectorius* dyes yellow, when fresh; brown-red, when dry; the dry bark of the *R. frangula* yields a brown or dark red, and the fresh a yellow dye. Mons. Buchner, of Munich, has obtained from the bark of the root of this buck-thorn a yellow and volatile colour, which he has named *Rhamnoxanthine*; it is found in smaller quantity in the fruit and the bark of the wood, as well as in the bark and seeds of *Rhamnus catharticus*. The alkalis dissolve it, and convert it into a magnificent purple. Dambourney secured a tolerably bright olive green on wool from the root of the *bourdaine*.

The bark of *R. catharticus* and *R. alaternus* dye yellow; the wood of the latter species dyes dark blue; and the root of the *R. infectorius* brown. Lastly, the leaves of the *R. alaternus* yield a yellow colour, and those of *R. frangula* a greenish yellow.

It will have been noticed that the wood of *R. alaternus* yields a *dark-blue*, and that the fresh bark of the same buck-thorn, and of *R. catharticus*, *frangula* and *infectorius*, contain a yellow colouring matter. A mixture of cuttings of the former and of the bark of the latter ought to produce a green. I notice this fact, to shew that the preparation of the *green dye of China*, as described by Father Helot, is possible, and I have noticed all the experiments to which the buck-thorns have been submitted, with the view of establishing the existence of a volatile principle, and to shew that the changes undergone in the colouring matter in the

different species, from red to violet, to blue, to green, and to yellow, are nearly the same. The *lo-kao* is imbued with similar principles.

It is probable that the *green dye*, so remarkable when exposed to light, is a compound of blue and yellow, having separately the same property, and united in the bark of *R. chlorophorus*. I shall notice below, when writing of the *hoang-tchi*, of the fruit of a *Gardenia* and of the *hoai-hoa*, the flower-bud of the *Styphnolobium Japonicum*, that my suspicion that the supplementary yellow of one or other of these items is obtained from them instead of a second species of buck-thorn.

VIII.

OF THE PRICE OF THE LO-CROU BARK, AND OF THE LO-KAO.

Bark of the Lo-chou.

At Azè, the *hong-pi lo-chou* costs in faggots 1000 sapeques for 100 Chinese pounds, or about $8\frac{1}{2}$ francs the 100 kilogrammes, and the *pe-pi lo-chou* 3000 sapeques per 100 lbs, corresponding nearly with $24\frac{3}{4}$ francs per 100 kilogrammes. Father Helot believes that the price of the latter is higher because it is brought from a greater distance. As it is believed that 100 lbs. of faggots yield 50 lbs. of bark, we must double the price of the former to obtain the value of the latter, viz. $17\frac{1}{2}$ francs the 100 kilogrammes for the bark of the *hong-pi lo-chou*, and $49\frac{1}{2}$ francs for that of the *pe-pi lo-chou*.

At Amoy the bark of the *lo-tsè* costs about 5000 sapeques the picul, or about 46 francs the 100 kilogrammes, and I have noticed above, that this is about the same price of this bark as that ruling at Azè.

In the province of Tchi-li the dyers buy 100 lbs. of the faggots of the wild buck-thorn for 2000 sapeques, or about 5 francs 70 cents per 100 kilogrammes, and 11 francs 40 c. per 100 kilogrammes of bark.

Lo-kao.

At Azè, 10 ounces of *lo-kao* cost Father Helot 15 dollars ; 12 dollars was the price current two days before he reached that place, and he adds that a French merchant had paid at Sou-tcheou-fou, 19 taels of silver for a Chinese pound.

The selling prices in China may be thus summarized, according to the differences in the exchange, which has risen materially between 1845 and 1857, and especially within the last four years. The exchange on London which was 4s. the dollar in Canton during March, 1849, had reached 5s. 10*d.* in August, 1853. At Shanghai, the mean of 1850, was 4s. 9*d.* ; of 1851, 5s. 1*d.* ; of 1852, 5s. ; of 1853, 6s. 3*d.* ; of 1854 and 1855, 6s. 6*d.* ; of 1856, 7s. $\frac{1}{2}$ *d.* ; and for the first ten months of 1857, 6s. 10 $\frac{1}{2}$ *d.*

The current coin at Shanghai at this time, for London bills, is either the dollar or the tael : the great rise in the exchange having temporarily equalized two currencies differing so entirely.

Date of Purchase or Advice.	Name of Purchaser or Consigner.	Place where Price was fixed.	Quality.	Price per Catty.*		Value of the Dollar in Fr. at the change of the day. †		Price per Kilogramme.
				Dls.	Cts.	Fr.	Cts.	
1845. January and July. 17th August. 1852.	The Commercial Delegates in China. Purchase of Mons. N. Rondot.	Canton. Ditto.		24	"	C. 5	65	224 "
21st August. 25th December.	Consignment of Mons. d. Bourboulon. Purchase of Messrs. Carvalho & Co.	Canton. Ditto.	1st. of Sou-tcheou-fou. 2nd. of Amoy.	28	"	"	50	255 "
1853. 16th January. 2nd May.	Letter of M. Arnaudtizon.* " of M. Carvalho.	Canton. Ditto.		35	"	"	25	362 "
9th July. 1856.	Purchase of Mons. Remi.	Shanghai. Canton.	1st. of Sou-tcheou-fou. 2nd. Ditto. 3rd. Amoy.	48	"	"	40	508 "
April. August. Ditto. Ditto.	Letter of Mons. Remi. Note of Father Helot. Purchase by do. " of a French Merchant.	Shanghai. Ditto. Aze. Ditto. Sou-tcheou-fou.		32	"	"	40	339 "
1857. 14th May. 15th June.	Purchase of an English Merchant. Ditto of a French Merchant.	Shanghai. Ditto.		20	15	S. 6	85	228 "
				40	"	C. 6	50	430 "
				36	80	"	50	396 "
				32	"	"	6	344 "
				21	60	S. 8	75	313 "
				22	"	S. 8	50	309 "
				19	20	"	9	286 "
				24	"	"	9	357 "
				26	50	"	9	394 "
				24	"	S. 9	40	373 "
				25	"	"	9	389 "

* The Catty or Chinese pound is 604 grammes (1½ lb. avoirdupois).—TRANS.

† Exchange at Canton (C.) or at Shanghai (S.) for 1st Class Bills at 6 months' sight.

To fix the delivering price at Lyons we must add, packing freight and insurance from Shanghai to Hong-Kong, and from Hong-Kong to Marseilles, commission for purchasing at Shanghai, and on transit to Hong-Kong and Marseilles, the charges at Marseilles, customs' duty, carriage from Marseilles to Lyons and petty expenses; I am not far out in setting down all this at from 10 to 12 per cent.

The selling price has varied at Lyons, and especially recently; it has risen to 750 francs the kilogramme, and been as low as 250; the ruling price for *lò-kao* has been from 400 to 500 francs per kilogramme.

A few words on the quality of the green dye. In Canton that brought from Sou-tcheou-fou is most esteemed according to Mons. Carvalho; that obtained from Amoy is very inferior to the former: its green is less blue, but with less brilliancy, and being frequently impure, the depths of its tint varies considerably, some of the *lò-kao*, is partly soluble, some nearly insoluble in water. It has begun to be falsified to a considerable amount.

IX.

OF THE PROCESS OF DYEING CALICOS WITH THE BARK.

Mons. Arnaudtizon, Father Helot and Mr. Sinclair have severally described the process of dyeing.

According to Mons. Arnaudtizon.—The bark is steeped for 15 or 20 hours in hot water; the cloth dipped into the bath when cold without any mordant, is spread on the earth during the night, to avoid the sun's rays and for the sake of a lower temperature; frost even is necessary; the side of the cloth that is next the ground is the darkest, and forms the right side [Father Helot and Mr. Sinclair say the reverse.] The cloth is dipped several times in the bath.

Father Helot's account of the process at Azè.—The fresh bark [he says the dry bark yields no colour, while Father Aymeri

assures us that the hill men of Hi-tcheou dry the bark thoroughly] of the *hong-pi lo-chou* being first boiled, remains infused for two days; the fresh bark of the *pe-pi lo-chou* is infused for ten days. Two separate baths are used in the operation, lime water being added to each.

The calicos are dipped from seven to ten times in the *hong-pi* bath, then three times in that of the *pe-pi*; the cloth is dyed after each immersion. The cloths are spread at night-fall, but the action of the sun is indispensable. The cloth is dyed only on that side that has been exposed to the sun.

Process of Kin-tcheou-fou.—The fresh bark of the *pe-pi lo-chou* is boiled; 63 grains of Chinese potash are added for every 100 kilogrammes of liquid, and the calicos are dipped three or four times in the bath; they are sun-dried after each immersion.

Its appears that alum is used in Chantoung, instead of lime-water and potash.

The reason for the difference in the processes of Azè and Kin-tcheou-fou, is that in the latter town, as further North, it is only desired to dye the cloth, and the *pepi* answers the purpose. At Azè the dyeing of cloth is the means of manufacturing the *lo-kao*; both species of buck-thorn are necessary, and the process is more lengthy.

Mr. Sinclair.—At Amoy the bark of the *lo-tse* is put into hot water; it is then boiled for an hour: potash and alum having been added, it is poured off, filtered, and allowed to stand during the night. The calicos are dipped in this infusion, and spread on the ground in the open air, to dry, in the morning, when the rays of the sun are less powerful. The reverse of the cloth is placed next the ground. It is sometimes necessary to dip the cloth and dry it twenty times, to obtain the required shade.

The reader must notice several contradictions. It is useless to dwell on them, and as to the objections that have been raised, Mons. Persoz and Mr. Mercer say; the first in a

letter of the 4th June, 1857: "The Chinese make Father Helot say that the green dye is imparted to the calico after frequent immersions in an infusion of the fresh bark. Now all the specimens which we have received from China prove that the colour cannot have been made fast in this manner, for they have all a right and a wrong side, clearly proving that unless two pieces had been previously stitched together, the colour has been applied on one side only, either with a knife, a brush, or some other mechanical appliance. Although this objection is not alluded to in the paper of Father Helot, it is clear the Chinese were anxious to anticipate, by asserting that the cloths saturated with colouring matter after immersion in the bath, were exposed to the sun, without whose action it could neither be developed nor fixed, and that subsequently the colour, not being fast on the side not exposed to the rays of the sun, has faded in washing, and presented that reverse noticeable in all the calicos dyed green in China. It is only necessary to expose these calicos to the sun to be convinced by the change that takes place, that it cannot have been formed and fixed in the manner described."*

Mr. John Mercer had several years ago, come to the same conclusions, and addressed a letter on the 29th October, 1853, to Dr. Lyon Playfair, from which I copy the subjoined extract:—

"On examining the green China cloth which I have had for some time, and other samples of the same kind recently received, I observe several shades of green, and some of a green more blue than others. This would be hardly the case if these cloths have been dyed with a substance yielding an original green.

* Mons. Michel has noticed a well-marked obverse and reverse in cloth dyed by immersion in a bath of buck-thorn bark, and spread during the night on the ground. The obverse, that is the darker surface (violet or green,) was that exposed to the action of the little light of the night.

“All the samples of Chinese green cloth I have seen to this day, are spotted here and there with deeper tints, produced by a violet blue, varying to red, especially in the centre when exposed to light. It is probable that this green dye is the result of an admixture of this blue colouring matter and yellow, and that the spots alluded to are caused by an imperfect preparation of the blue.

“A piece of this green cloth submitted to the action to an acid, washed, then dipped in a solution of carbonate of soda, assumed a purple, sometimes a reddish, colour. This cloth, touched with the proto-chloruret of tin, becomes bright orange; washed, and dipped into a solution of carbonate of soda, it assumes a fine rose colour; exposed to the air it is re-oxydized and assumes its natural colour. These changes prove that the base of the dye, is the same substance that has caused the dark spots I have mentioned.

“The cloth dyed with the green dye of China is much darker and more blue on one side than the other: and also a deeper blue. For some time I thought it might arise from the habit of the Chinese of spreading the dyed and wet cloth on the grass, between eight and nine o’ clock in the morning, when the ground is still fresh and perhaps damp. When the dye is soluble the evaporation being entirely from the upper surface, the liquid would be drawn to that side, and carry the colour with it; the water evaporating would leave a greater amount of colour above than below. At the same time the heat of the sun acts while the cloth is drying, so as to fix the colour, and effect to a small degree what is done more energetically by evaporation. But these surmises do not explain the spots that appear all on the obverse, as if the blue, with or without yellow, had been spread on the coarsely prepared cloth, and in a state of paste, by some mechanical process. If this view be correct these cloths have not been dyed by the means described by the interpreters, but by an improved and more rapid process, or a better imitation of the means known to our dyers.”

X.

OF THE PREPARATION OF THE LO-KAO.

The cotton cloth having been dyed by repeated immersions in infusions of bark, and dried without washing in pure water, the *lo-kao*, is, according to Father Helot, extracted from the surplussage of dye-stuff in the cloth.

The dyed cloths are dipped into cold water several times, and well shaken; the water is then collected in a kettle, a layer of cotton thread is then spread on the surface of the water; fire is applied; during ebullition the colouring matter is deposited on these threads; more of the water in which cloths have been rinsed is added, till the threads are sufficiently charged with colour. They are washed in cold water, and well rubbed with the hand. The *lo-kao* is detached and precipitated. I omit minute details, they are found in the memoir of Father Helot. Finally, the precipitate being well washed till it becomes a thin paste, is spread on a thin sheet of paper lying on ashes. It is first dried in the shade, and then in the sun. The layer of *lo-kao* detaches itself from the paper, shrivels up, and breaks into small irregular, thin, light fragments with a good glance.

The account of the preparation of the *lo-kao* is very much the same.

Generally speaking, a layer of cotton thread, weighing about 3 kilogrammes and 620 grammes is required to exhaust the waters used to wash three hundred pieces of cloth. Forty pieces yield 37 grammes of *lo-kao*; 283½ grammes are therefore obtained from one layer of cotton; each gramme represents 1,060 pieces of dyed cloth.

One of the establishments at Azè dyed in 1856, according to Father Helot, 8,000 pieces, and sold about 7½ kilogrammes of *lo-kao*, and the five dyeries of Azè could not furnish more than from 18 to 24 kilogrammes. But the green dye is also prepared at Sou-tcheou-fou, in the neighbourhood of that

town, and in several boroughs of Kiang-Sou, at Ning-po, and in other towns of Tche-kiang, in Hou-nan and in Fo-kien; it must indeed be prepared in considerable quantities as a friend at Shanghai, wrote on the 20th April, 1857, of the possibility of sending 800 or 900 kilogrammes of *lo-kao* to France, which would lead to believe that one million of pieces were dyed. This is not to be wondered at; cotton cloths dyed half and half are very generally used by the people; the light green is the favorite colour of the women, and the Fokienese all wear blue and green cotton turbans.

The customs' department announces the importation into France, during the first six months of 1857, of more than 590 kilogrammes of *lo-kao*; as it is classified, for the purpose of fixing the duty among the *undefined colours*, it may be declared and entered under that general designation; this leads to the inference that more may have been imported under other designations.

XI.

OF THE DYEING OF COTTON CLOTHS WITH THE LO-KAO.

The *lo-kao*, notwithstanding its very high price, is used in China to dye common cotton cloths. The fact cannot be doubted. Messrs. Arnaudtizon, Remi, Edkins, and Father. Helot, notice it, and the two first are eye-witnesses. It is true it is for light colours only, one liang (37 grammes 79,) of *lo-kao* being sufficient for from 10 to 30 pieces of cloth, according to the depth of the shade, or from 7 to 21 centimes of *lo-kao* for a square metre. It seems that dyeing with the barks and with *lo-kao* costs nearly the same, or about 5.100 of a dollar (40 centimes) per square metre as mentioned by Father Helot.

Mons. Remi wrote to me, on the 25th February, 1853, as follows, regarding this dye-stuff:—"In the course of an excursion made by our dear consul (Mons. de. Montigny) and

myself, in the vicinity of this great manufacturing metropolis, he visited several establishments where cotton textures are dyed green with this same substance, and from that time it attracted our attention.

The following is the process adopted at Sou-tcheou-fou and at Shanghai; the *lo-kao* is not employed in dyeing either at Azè or in the neighbouring villages where it is manufactured. The *lo-kao* is dissolved hot in Chinese potash. The cloth, having been well rinsed, is dipped into the bath at a temperature of between 50 and 60 degrees; wrung on a peg, shaken out, dipped a second time, wrung again, rinsed in pure water, and dried in the open air.

For every 100 grammes of *lo-kao*, 1000 grammes of Chinese potash must be used according to Mons. Arnaudtizon; 1000 grammes according to Father Helot, 30 says Mr. Edkins.

XII.

OF THE DYEING OF SILK AND SILK FABRICS.

“I have been assured,” says Father Helot, “that silk cannot be dyed with the *lo-kao*. I do not know whether the Delegates brought back any silk fabrics dyed with the *lo-kao*, it would be easy to ascertain by consulting the experiments made at Lyons in 1847 by Messrs. Michel, Guinon, Vidalin and Renard on Chinese and Cochin-Chinese dye-stuffs. But Madame de Montigny, who was recently in Paris, had a China silk dress dyed with this substance.

A silk manufacturer, well known to those who have lived at Canton, Yi-ching senior, whose warehouse is in Tongwan-kai, was the first who sold the *lo-kao*, or that portion received by M. Guinon.

The packets bore the inscription:—“Selected with care to dye chain-silk.” The sample I obtained at Canton in 1845, was purchased of a silk dyer.

Further evidence.—I find it stated in a Canton letter of the 26th November, 1852, that “the use of the *lok-kouh* by the Chinese, is limited to fine paintings, and for dying expensive silks.” In a letter of April, 1853, it is said :—“The *lok-kouh* is used for silk ; it is possible that other substances are mixed to make it available.”—In a third letter of May, 1853, I find :—“It seems that the Chinese use the *lok-kouh* as a last bath for cotton stuffs ; but this does not apply to silk.”

Mons. Remi wrote me in 1856 :—“The green suited to the dyeing of cotton and silk, most certainly comes from the bark.” Lastly, I shall quote an extract from a Shanghai letter to a friend of mine in London :—“As for the green silk fabrics, there are some very beautiful, especially the plain, both light and darker coloured ; the merchants can distinguish at first sight, even with colours strongly resembling each other, those which are dyed with the *lo-za* and the *lo-kao*. The latter are held in greater estimation, and of a higher price, but I could not exactly understand wherein consisted the superiority of this expensive dye ; silk is dyed with the *lo-kao* at Sou-tcheou-fou and Hang-tcheou-fou.”

The Rev. Mr. Edkins observes, that if not more frequently used for dyeing silk, it is on account of the high price of the stuff ; he adds that the *lo-kao* seems better suited for rough cloths, such as cotton and grass-cloth (prepared from the *Urtica nivea*), that it has been long used by artists for paintings in water-colours, but as a dye-stuff only during the past twenty years.

Again, a dyer of Kin-tcheou-fou, assured Father Helot, that in that town the bark of the *pe-pi lo-chou* was used to dye silks, but that the process was less successful than with cotton.

It is not yet known how the Chinese dissolve the *lo-kao* and apply it to the dyeing of silk. Our dyers, however, have nothing to learn on this head from those of the Celestial Empire.

At Lyons, Mons. Guinon, in March, 1853, and Mons. Michel in April of the same year, only to mention the most successful, undertook experiments that speedily afforded them the most interesting results, but the general application of the *green dye of China* to the arts, dates from the spring of 1855. In April of that year, Mons. Guinon dyed with pure *lo-kao* spangled and cut velvets, whose green was so analogous to that obtained from the acetate of copper, that he named it *Venus-green*. These velvets were sent to the Universal Exhibition by Messrs. Gondre and Co. . The addition of yellow to the *lo-kao* was only adopted in the month of July following, when a charming shade was obtained, so pleasant when exposed to the light that it has retained the name of *Azof-green*. Messrs. Million and Co. produced in August the first dresses of this kind. Fashion had not stamped this beautiful novelty, when in October and November, 1855, rich plain stuffs dyed with the *lo-kao* were found in the warehouses of Messrs. Heckel, Teillard and Ponson.

It was about this time that Mons. Michel discovered the process that bears his name ; he presented to the Chamber of Commerce a remarkable series of samples of bright and dark shades at their sitting of the 24th January, 1856, and he read on the 6th March following, the report in which he described the means of dissolving and dyeing he had so successfully practised. This process has, since the middle of 1856, been adopted with advantage by several dyers of Lyons.

Up to that time the *lo-kao* was but little known. Mons. Guinon alone had succeeded in making use of it ; he maintained, and still maintains, his peculiar secret. The secret of the origin of the colour of those elegant dresses, that were so much admired in the autumn of 1855, was even so well preserved, that Mons. Michel only became aware of it after the publication of his own discoveries. His memoir directed general attention to this new dye-stuff, and its consumption began materially to increase. To mention only one example,

I may state Mons. Guinon who had, from April, 1855, to March, 1856, only dyed about 1,500 kilogrammes of silk with the green dye, turned out more than 3,500 kilogrammes between April, 1856, and March, 1857.

XIII.

OF THE PROPERTIES OF THE LO-KAO.

The properties of the *lo-kao* are described in the following works :—

On a Green Colouring Matter brought from China, by Mons. J. Persoz.

Note on a Green Organic Substance, used in China for the Dyeing of Cotton, by Mons. E. Mathieu Plessy (*Bull. of the Ind. Soc. of Mulhausen*, 1853, Vol. XXV, pp. 96 to 104.)

First Report of the Department of Science and Art, pp. 434 and 435).

Report of the Chamber of Commerce of Lyons on the Green Dye of China, by Mons. H. F. Michel, March, 1856, (first publication of the Chamber.)

Of the Green Chinese Dye named "Lu-koe", by Mons. J. A. Van Eijk, 1856, (*The Volks-vlijt*, 1856, Vol. XXXI. pp. 410 to 417.)

Note on a Green Dye from China, by Mr. Dan. Hanbury, October, 1857, (second publication of the Chamber, 1857, pp. 37 to 39.)

Further Particulars of the Green Dye of China, by Prof. Bleekrode, 1857, (*The Volks-vlijt*, 1857, pp. 320 to 323.)

I refer to these documents, especially to the remarkably complete memoir of Mons. Persoz, for the chemical and dyeing properties of the green dye. It will be found at the end of this volume.

I cannot sufficiently dwell on the most interesting, and, for silks, the most useful character of this dye, viz., the beauty and extraordinary intensity which the colour acquires when

exposed to artificial light. This brilliancy, attributed by some to the homogenous character of the colour, by others to the purity of the blue and yellow tints that form this green, was noticed so early as 1853, by Mons. J. Duperay, of St. Aubin, Epinay. He places the *lo-kao*, on account of this quality, above all other known greens.

(*To be continued.*)

THE INDIGENOUS PLANTS OF BENGAŁ.

Notes on peculiarities in their structure, functions, use in medicine, domestic life, arts and agriculture: By the REV. J. LONG.

(*Continued from page 43 of PART I, VOL. X.*)

ENDOGENS OR INWARD GROWERS.

Have one seed lobe. Harder outside than inside. Leaf veins not net-shaped.

About 50,000 species known. Parts of the flower arranged in threes.

63. **HYDROCHARACEÆ, or Frog Bit Tribe.**—Floating plants in fresh water; flowers with a spathe, or cover, when young. These plants live under the water, except just at the time of fertilisation, when the flowers rise for a few hours above the surface.

Rasanjāngi (Vallisneria alternifolia).—Grows in rivers and rapid streams where the level is not always the same. In order to enable the pistilline flowers to keep on the surface of the water, which is necessary for the fertilisation of the seed, they are made lighter than the water, and are mounted on long corkscrew-like stalks, which, by their elasticity, extend as a spiral spring when the surface of the water rises, and contract when the water sinks. When their pollen is mature, and the anthers are ready to burst, the flowers producing it detach themselves, rising by their lightness to the surface, and dis-

charge their pollen; when the seeds are ripened, the spiral flower-stalk again contracts, and carrying down the dry fruit, buries it in the mud.*

Patá shyéalá (Blyxa octandra).—Leaves sword-shaped. Used for supplying water mechanically to sugar in the process of refining it, as clay is used in the West Indies to permit the slow percolation of water. Its stamens have the same property as the last named plant, and hence its Sanskrit name *shaivál*, “the sleeper on the water.”

Páni kalá (Ottelea allsmoides).—The seeds are affixed to six sharp keels running on the inside of the joinings of the valves.

64. *ALISMACEÆ, or Water Plantain Tribe.*—Aquatics. Seeds hooked: embryo of a horse-shoe shape. Many have a fleshy rooting stem, which is eatable.

Chota hat (Sagittaria sagittifolia)—Flowers in spring. Leaves arrow-shaped. In China cultivated for its roots, which are eaten. The root is composed of many fibres, from a crown formed by the united leaves, the centre one thicker, and ending in the half putrid remains of the small round bulb which gives existence to the plant, while from its sides many suckers run a few inches, each ending in a small round bulb, which in due time produce other plants.

Bara hat (Sagittaria obtusifolia.)—The seed is bent double, with the two extremities pointing to the base, by one of which it is fastened to the bottom of the fleshy fruit. Various Brazilian plants of this *sagittaria* genus yield, from their astringency, a juice employed in making ink.

65. *LEMNACEÆ, or Duckweed Tribe.*—Floating plants. Composed of a little green scale, which looks like a leaf; from its under side hangs down a single root fibre. The leaves have acrid properties.

* Darwin has made this a poetic subject in his “Loves of the Plants.”

Tákápánú (*Pistia stratiotes*).—Two other species in Bengal, well known by the appearance of a green scum they give the water. The leaves are made by Hindus into a poultice for piles, and a decoction of them is used for their cooling properties and in cases of a difficulty in passing of urine. The leaves float on the water, absorb a great quantity of the noxious vapours as fast as they are exhaled, and change them by the aid of the sun's rays into respirable air. This change is effected by the *pistia* more than by any other plant: it is so powerful a preventative of decomposition in stagnant water, that fishes are preserved alive in water in which otherwise they would not live: this is particularly the case in Batavia. Sir C. Napier, inspecting the lines of a native regiment in the Punjab, observed coolies drawing water from a tank covered with a slimy and greenish weed, the *pistia*; he ordered it should be immediately cleaned, so it was,—but it was not until a fresh crop of weed had grown that the water became drinkable.

66. ORCHIDACEÆ.—Called Epiphytes, but by the Hindus by a simple name “sons of trees.” Of 1900 species, only two are known in Bengal, though very numerous in Assam.* Their flowers are so curious in their shape that there is scarcely a common insect, or snake, or monkey, to which some of them have not been compared.

Svet Huli (*Zeuxina sulcata*).—Found in pasture ground near Calcutta at the close of the cold season, the three upper petals of the corolla are helmet-shaped.

Budbari (*Eulophia virens*).—Flowers in the cold season; bulbs conical, flowers streaked.

* A gentleman from Assam, Capt. Lowther, has promised to furnish the Agri-Horticultural Society with a list of Assam plants on the plan of the present one. We trust he will give a full account of Assam orchids with the native names of all the plants.

67. ZINGIBERACEÆ, or *Ginger Tribe*.—The shape of their roots has given them the Sanskrit name *shringavera*, i. e., “root horn-shaped.”

Adā (*Zingiber officinale*).—The seeds are seldom met with, on account of the great increase of the roots, which are biennial. Used by the natives in cases of paralysis, rheumatism, and intermittent fever; in the Dacca district ginger yields eight to ten maunds per biggah. The natives cleanse the roots in boiling lime water, which probably injures much of the fragrant pungency: whereas in the West Indies they use simply cold water. Nearly 90,000 cwt. of ginger was imported from the East and West Indies into England in 1852.

Bach (*Zingiber zerumbet*).—Broad-leaved ginger. Leaves and shoots used as greens. Grows wild in the Concan.

Huldi (*Curcuma longa*).—Turmeric. From the dry root, powdered, and mixed with powdered wood of *Cæsalpinia sappan* is obtained the red powder used by the Hindus in the Huli games, hence probably its Sanskrit name *yoshitpriyā*, “beloved by women.” The Javanese apply its nuts pounded and made into an ointment to cure skin diseases, while the Hindus use it in bruises and leech bites, in cleansing ulcers, in diarrhoea and for worms, hence its Sanskrit name *krimigna*, “the worm-killer.” It is used for seasoning dishes, and as a dye, but the colour does not last. It yields from 60 to 300 maunds per biggah.

Ban huldi (*Curcuma aromatica*).—The flower often appears before the leaf.

Kāla huldi (*Curcuma cæsia*).—The leaves have down their middle a deep ferruginous purple cloud. The roots of another species, the rubescens, yield a starch like arrow-root. In Travancore it forms a large part of the diet of the inhabitants; it has never been tried much in Bengal.

Chandra mula (*Kampfæra gulanga*).—The flowers have a purple speck on the centre of the division of the inner border. Leaves spread flat on the surface of the ground. The

roots are valued as a perfume and medicine, hence probably its Sanskrit name *chandramuliká*, "moon root."

Bhui champa (*Kæmpfera rotunda*).—The beauty of its flowers, which blow only for a day, and its having no stem, gave it its Sanskrit name, "the champa of the earth." If at the flowering time there are no leaves on the plant, the envelope of its flower is shaped like the tiles of a house.

Madan nirbishi (*Kæmpfera angustifolia*).—The natives give the root as medicine to their cattle.

Dulál champa (*Hedychium coronareum*).—Throws out a profusion of large beautiful fragrant blossoms for a long time.

Tárá (*Alpinia galanga*).—Root biennial or perennial, the stem is entirely covered with the sheath of the leaves; flower a beautiful rose colour, but no scent, though the root is aromatic. The juice of the root is used as a remedy in hæmorrhoids. Near Dacca they make twine and rope from the plant.

Keo (*Costus speciosus*).—A preserve is made by the natives from its root; though the fresh roots are almost insipid. The plant is a handsome one, with soft velvety leaves spirally arranged.

68. CANNACEÆ, or *Arrow-root Tribe*.—Starchy roots, reed-like plants, with beautiful flowers.

Mukta páti (*Maranta dichotoma*).—Mats are made from the split stem, which is hence called *shital páti*, or "the cooling reeds." A tough fibre is obtained from this.

Sarbajay (*Canna Indica*).—There are two species, the red and white: the former used by the Burmese for sacred beads, and by Hindus for necklaces. It is called Indian shot, because its seeds are shot-shaped; they are used as a substitute for coffee, and yield a purple dye. A watery secretion takes place from the points of the ribs, which terminate at the margin of the leaves. The leaves are used to thatch houses with in Cayenne. Nearly all the species contain starch in the root-stock, which renders them fit for food after being cooked. The root, boiled in rice water with pepper, is given sometimes to cattle whose

belly is swollen from having eaten some poisonous grass. It is in flower and seed most part of the year.

69. *MUSACEÆ*, or *Plantain Tribe*.—Flowers on spikes. Curved leaf veins. No proper stem, as the leaves are sheathing encircling each other, and enveloping layer within layer the flower and fruit stalk. The *rám kalá*, or wild plantain, ripens its seeds six months after blossoming, the plant then perishes down to the root.

Kalá (Musa Paridisiaca).—The fruit has no acid, hence it is good for bilious persons. The banana is like it, but its stalk is marked with purple spots, and the fruit is shorter and rounder. Its fibrous bark is made into cloth and cables. The leaves were said to be like Ostrich feathers, as they form no network, and easily split. There are twenty varieties of plantain in Tenasserim, ten in Ceylon, and thirty in Burmah.

From Asia it has been introduced into the West Indies and South America; and into England in 1680. It is more productive than wheat. In South America the fruit is dried and preserved, while the flower is separated and made into biscuits. The fruit can keep for twenty years, owing to the sugar in it. 100 parts of the recent fruit contain 27 of dry nutritive matter—the potato gives 25. In the plantain fruit out of 100 parts there are of water 14, starch $67\frac{1}{2}$, gum $4\frac{1}{2}$, cellular fibre $4\frac{3}{4}$, sugar 2, oil $\frac{1}{2}$, albumen $4\frac{1}{2}$, ash $2\frac{1}{2}$. A sucker attains maturity in a year, each produces fruit weighing from 25 to 90 lbs. In the West Indies the spiral vessels of the flower-stalk are used as tinder. One tree gives 4lb of fibre; 600lb weight of fibre might be produced annually from each acre of plantains. The plantain is used as a nurse or shade to the betel, vine, or areca. The top of the stem yields a juice good for making ink. The fibre can furnish material for paper and canvass, thus the plantain gives food for body and mind. The Chinese use the young shoots for paper-making. Called in Sanskrit *báranballabha*, “pleasing to the elephant.”

The plantain has many *spiral vessels*, *i. e.*, membraneous tubes in the conical extremities, the inside being occupied by a fibre which uncoils itself elastically; this may be spun into thread.

Jagynavalykea, the great Hindu legislator, in the 3rd book, 8th section, compares human life to the plantain tree without pith, *i. e.* empty and vain. Its long leaves 7 feet, with their parallel veins at right angles to the mid rib, led to its being compared by the ancients to ostrich's feathers, and to the Sanskrit name *ácýathchadá*. Its spike often has fruit weighing 40lbs. Its Latin name was given it on the supposition that it was the forbidden fruit Adam eat. 1607 square feet of ground yield 4000lbs of nutritive substance from plantain, which will support 50 persons, the same space planted with wheat will support only two. It is in season all the year round. The Dacca plantain is nine inches long, in Madagascar the plantains are as large as a man's forearm. In the mountains of the Phillippine Isles a single fruit or two is said to be a load for man. All the large ones require, like potatoes, to be roasted. Valuable cordage, in large quantities, is made from the plantain stem in Manilla, and extensively exported. Hemp, and the finest flax can be made from its fibres and tissues, almost as fine as those from the fibres of the *ananas*. The *fruit* dried in the sun keeps perfectly a length of time, and resembles a rich fig. Twelve months after planting, 70lbs of fruit are often obtained from a single plant. The south of Spain is the only part of Europe in which the banana is cultivated in the open air. The *veins* diverge from the mid-rib along its whole length, and lose themselves in the margin.

A curious mistake is made in *Loudon's Encyclopedia of Plants* respecting the plantain, he writes "three dozen of plantains are sufficient to serve one man for a week, instead of bread, and will support him much better."—We can only say we should be sorry to be that man.

70. **AMARYLLACEÆ.**—Bulbous-rooted. One of the few exogen orders in which poison is found. The *Agave* so useful for its fibre, for hedges, soap, sugar, wine and paper, belongs to this order.

Bara kánar (*Crinum Asiaticum*).—Under side of the leaves elegantly striped, bruised and mixed with castor-oil they are used in inflammations; in the N. W. P. they give the juice of the leaves for ear-ache. The root is used as an emetic in Java, and is considered by Dr. O' Shaughnessy, to be equal to *Ipecacuanha*.

Sukh darshan (*Crinum defixum*).—Flower fragrant at night.

Biláti anannas (*Fourcroya cantala*).—Flowers when 12 years old.

71. **DIOSCOREÆ, or Yam tribe.**—So called from *Dioscorus*, the most ancient writer in materia medica, 1800 years ago. Tuberous roots: leaves with net shaped veins; twining. The various kinds are distinguished by the shape and colour of the roots. The West Indies is their favourite country; they are there what the potato is in Ireland; raw they have an acrid principle. Though in such use among natives, none have a Sanskrit name, and are not indigenous.

Chupri álu (*Dioscorea globosa*).—The favorite yam among natives. Stems have six wings, with the angles. Membrane winged, and prickly towards the root.

Khám Alu (*Dioscorea alata*) square stems.

Rakta garániya álu (*Dioscorea purpurea*).—When the roots are more than one year old, the lower permanent parts of the stems are generally armed with prickles.

Gorániya álu (*Dioscorea rubella*).—Flowers very fragrant.

Man álu (*Dioscorea aculeata*).—Called in Bombay the Goa potato: root two lbs. weight.

Susni álu (*Dioscorea fasciculata*).—Natives extract starch from the roots. Has several stems.

Kukur álu (*Dioscorea anguina*).—Tubers columnar, perpendicular in a loose soil, but variously bent in a hard one.

Shir álu (*Dioscorea nummularia*).—Stem many fathoms long : lower part prickly.

Kántá álu (*Dioscorea pentaphylla*).—Not cultivated in Bengal, but very much so in Amboyna.

72. BROMELIACEÆ, or Pine Apple Tribe.

Anannas (*Anannás sativus*).—An American plant ; its name is of Brazilian origin, the name *pomme de pin*, “pine-apple,” was given it by the Spaniards from the supposed resemblance of its fruit in shape to some pine cones. It was unknown to the Arabs, Greeks, or Romans. Cloth as fine as muslin is made from the fibres of the leaves.

A pleasant wine is made in Jamaica from its fruit. The best in the world are the Bengal : It was introduced into Bengal in the reign of Akbar by the Portuguese, who brought it from Malacca. In Mexico they are commonly suspended to the balconies for the sake of filling the house with their delightful fragrance, as they can subsist for a long time on the fluids they contain, or on the moisture they absorb from the atmosphere. The fruit consists of numerous concrete ovaria, with the adherent perianths become succulent. The unripe juice has caustic properties, and can corrode a knife.

It is propagated by suckers, from the tuft of leaves at the top, a continuation of the axis. In Tenasserim a boat-load is sometimes sold for one rupee.

Discovered in America in 1513, in 1594 it was cultivated in China, the fruit was first brought from Santa Cruz to the West Indies then to China ; and at a subsequent period to Bengal in the East Indies. Introduced into England in 1690 from Leyden ; the English fruit equals the tropical, and is called the “queen of fruits.” 50 varieties cultivated in England in stove hot-houses. In Italy it does not thrive, as the leaves are so porous, and the climate so dry, that it shrinks up. The Society Islanders call it the white man’s *pandanus*, because its foliage, and matured fruit, are like those of the *pandanus*.

It is called by natives *kutl suffree*, or “the jack for a journey,” as its fruit ripens even when carried about.

73. SMILACEÆ, or *Sarsaparilla* Tribe.—Climbers.

Kumáriká (*Smilax ovilifolia*).—Armed with strong prickles. Considered to have all the properties of sarsaparilla. Root mixed with cucumber, ginger and oil is used in headaches.

74. PONTEDERIACEÆ.—Aquatics: blue flowers.

Nauká (*Pontedera vaginalis*).—Its Sanscrit name, *nilutpal*, “the blue lotus,” denotes the qualities of all of this order. Three other species in Bengal. The root masticated is considered a remedy in tooth-ache: its bark pulverised along with sugar is eaten for asthma. *Pontederia hastata* common.

75. LILIACEÆ.—Bulbous roots. Beautiful flowers, used among natives as the symbols of purity and modesty.

Rajani gundha (*Polianthes tuberosa*).—The Malays call it “the mistress of the night,” as at night it scents the strongest; a great favourite in Cochin-China; it has been observed after thunder to emit sparks of a bright flame from those flowers that were fading.

Murba (*Sanseveria Roxburghiana*).—Bowstring hemp. Its fibres silky, but strong, called China grass, very valuable for rope or paper. The ancient Hindus used a thread extracted from its leaves to make the *paita* of the Khetry class.

Grita kumári (*Aloe Indica*).—This may thrive in poor soils, as, in common with the aloe tribe, it draws its chief nourishment from the air; the fibres are valuable. An ink is prepared by Muhammedans from the juice of the pulp; this juice also used for sore eyes.

Rasun (*Allium sativum*).—Garlic. The expressed oil is used by the native doctors in rheumatism, in asthma, cough, and for promoting digestion, particularly among vegetarians. The author of “*Talif Sherif*” has employed its sherbet with much effect in cases of paralysis.

Gandan (*Allium ascaloneum*).—Schallot. Stem flat-leaved. Stamens three-pointed.

Peyáj (*Allium cepa*).—Onion. Came originally from Egypt. Used by natives for hæmorrhoids, and baldness. Its Sanskrit name *latárka*, “sun-creeper,” denotes the value set on it.

Hilluá (*Asparagus officinalis*).—Asparagus. Leaves bristly.

Shalamuli (*Asparagus racemosus*).—Root very fragrant; has many tubers; boiled in milk it is given in bilious disorders, but the bark must be removed, as it is poisonous. The leaves boiled and mixed with ghee are applied as a poultice to boils.

76. COMMELYNACEÆ.—Spider worts. The fleshy roots of some contain starch, which when, cooked, are fit for food. The Chinese use some of them for coughs, asthma, &c.

Páni kánkra (*Commelina salicifolia*).—Flowers deep azure.

Kánkra (*Commelina Bengalensis*).—Flowers blue.

Jatá kánkra (*Commelina communis*).—Flowers a bright blue.

Kándali (*Aneilema nudiflorum*).—Flowers small and blue.

77. PALMACEÆ, or *Palm Tribe*.—Called by Linnæus in modern times, and by Amer Sing in Hindu times, “kings of the grasses.” They vary much, some are 5 feet long, some 500; out of 1000 species ascertained, very few are known in India. South America seems to be their favorite locality. They are of all orders, the most useful for economical purposes, food, building, clothes, lights, &c.

Supari or *Guyá* (*Areca catechu*).—Betel. There are 20 different species, one of these, the *Rámguya*, is found at Chittagong. It is a social plant, growing in groups marked by their beautiful appearance, hence likened by an Indian poet to an arrow shot from heaven. This palm often grows 50 feet high, with a diameter of 2 feet, has no branches; its leaves are very beautiful, forming a round tuft at the top of the trunk, which is usually about 6 or 8 inches in diameter, straight, round, and marked with parallel rings. The leaves which are feathery, spring forth in pairs, that alternately

cover each other, encircling the top of the trunk, and thus producing an oblong head larger than the trunk itself; they are not more in number than six or seven, feet long, on a stalk 4 feet in length. These leaves break and fall off in succession, and from their axils issue the sheath which enclose the flowers and fruits. The fruit is called a *drupe*, about the size of a pullet's egg, and does not fall from the tree even when ripe, it has a yellowish shell, thin, with arched veins cohering with the pulp all round. In Johanna, the nut is used for dying cotton red, or making ink. On the Coromandel Coast 300 nuts on an average grow on one tree. A cargo of betel nuts generates so much heat that the crew cannot sleep between decks. A good tooth-powder is made from the nuts. In the Cossyah country the natives measure distances by the number of mouths of betel-nut chewed on the road.

Bet (Calamus Rotang).—Ratan. More than 4,000,000 are shipped annually from India. Delights in a rich moist soil, where there are bushes and trees for it to climb on: Fl. R.S. Fr. C.S. Climbing to a vast extent, enveloped in the thorny sheaths of the leaves. *Leaves* feathery, eighteen to thirty-six inches long. *Leaflets* armed on their margins with minute bristles pointing forward, and a few erect distinct long bristles on the upper surface. *Sheaths* armed with numerous compressed thorns: *Leafstalks* channelled, having straight and recurved thorns on the under side. *Flagelli* one from the sheath of each leaf near its mouth, like the lash of a whip; A bridge eighty feet in length has been constructed in the Himalayas entirely of ratan. The shape and flinty secretion of this gives it an affinity in some points more with the bambu grasses than with the palms.

Tál (Borassus flabelliformis).—Palm tree. In the Madras Presidency a caste called *shanars* draw the toddy or juice from it. The tree lives to a great age: the wood is harder at the bottom than at any other part of the stem. The

diameter of the stem differs very little in size when the tree is young; in consequence of this, and of its cylindrical form, the palm is never strangled by creepers, as many exogens are, the bambu however when old, increases in diameter from half an inch to two feet; some *palm* trees bulge out in the middle, and then contract again.

The number of external rings which indicate the fall of leaves from the trunk of palm trees, is supposed by some to coincide with the number of years the tree has lived. The leaves are palmate, plaited, and cowled: stalks serrate, near six feet long, flat, a little hollow and rough, with spines along the edges. The fruit varies in size from a small orange to that of a child's head. In Celebes it is called *tal*. Its Sanskrit names are *kasapatrabân*, "with saw-leaves,"—*tantaniryas*, "thready exudation,"—*trinadrum* "the grass-tree.

The veins are straight, arising from towards the base of the mid-rib, with which they lie nearly parallel. 100 can be planted in one beegah, and they fertilise the ground, for the grooves of the leafstalks, and the leaves, are well adapted for conveying rain water. The top of this tree is often seen issuing from the stem of a banyan, owing to the birds dropping seeds on the palm tree, which germinate. A native work gives 801 uses of this palm; the natives apply the sap of the root and trunk to cure sores, and in cases of dysentery. A flour is made in Ceylon from the seeds.

Tará (Corypha taliera).—The leaves are palmate, pinnatifid, sub-rotund, plaited; the inflorescence is shaped like a pyramid: it flowers in March, and the seeds ripen ten months afterwards. Trunk about 30 feet high. Leaves used to write on with pointed steel bodkins, and for the rafters of houses. Leafstalks from 5 to 10 feet long.

Bajur (Corypha elata).—Flowers in March, but seeds require twelve months to ripen.

Khajur (Phœnix sylvestris).—Wild date. Its Sanskrit name is *madhukeshir* or "honey-milk"

The *Phœnix dactylifera*, the chief food of the Egyptians, gave its name to Phœnecia. There are 46 varieties of it in Sahara, and almost all the population of Fezzan live on the palm dates for 9 months of the year. It bears from its 10th to its 35th year. Each tree yields about 180 pints of juice: Every twelve pints give by boiling 1lb of goor, yield 7lbs of sugar. A single spathe contains about 12,000 male flowers; but this tree does not thrive in Bengal, owing to the heavy rains.

Hintál (Phœnix paludosa).—The trunks of the smaller ones are used by the natives as walking sticks; they think when provided with such a staff that snakes will get out of their way.

Nárikel (Cocos-nucifera).—Cocoa-nut. The liquor toddy, is obtained by wounding the spathe of this tree, which is two feet long; a cup-full in the morning is good for constipation, and purifies the blood; in the day time the heat ferments it; an inferior sugar is also made from it. The liquor in the growing cocoa-nut is a refreshing drink. By scraping down the ripe kernel of the cocoa-nut, and adding a little water to it, a white fluid is obtained by pressure, which may be used as a substitute for milk. The oil is used for the hair, for burning, and, in England, for soap and candles. At the top the germ of the new growth yields a substance which is a substitute for cabbage. Vinegar is procured from toddy. On the outside of the lower part of the branches, where they spring from the stem, and are partially covered with the coarse vegetable matting of the tree, is a soft, downy, light brown coloured cotton. It is used for stanching blood. The Hindus say Visamitra created it in his progress to make a human being, in rivalry of Brahma, the nut being the first rudiment of the head, and that the eyes can be seen. It is not a native of America. On Ceylon, along the coast between Colombo and Matura, for 100 miles, there is nothing but one cocoa-nut garden. On the shores of the Gulf of Curicao

there are groves of 9,000 plants. One of the nineteen Hindu castes, the Shanar, is exclusively devoted to the cultivation of the cocoa-nut: which is deified by Hindus. The winged leaves extend in a graceful curve. Leaves eighteen feet long, twelve in number, radiate as spokes. The mid-rib is ten inches in circumference: the flowers, enclosed in a sheath. The *roots* are not wide-spreading, hence it is planted near Hindu houses, and its shade nourishes a good grass. A bird builds its nest at the extremity of its leaves. It has patrician rank among the palms, rising with one foot diameter to eighty feet, marked with circular rings, and a fibrous bark near the root. The male and female *flowers* grow on the same stalk. In the lower part of the shell is a hole through which the germ issues. The closed bud, flowers, tender drupe, immature nut, in all the different stages of progress, at the same time appear on one tree. The Coromandel cocoa-nut is a reddish yellow colour, hence called the Brahminical nut. The Canarese husk is green. The Malabar has its fruit turbinated. The sea air is necessary for it, even sea water does not rot the roots. Lives to 80 years, gives fruit from 40 to 50; after 60 declines. Should it lose its head, its roots cease to acquire nourishment. The seed is sown in the husk; after 18 days the germ comes up: one month after sowing the root is strong enough to burst the shell; the roots are very deep, hence little affected by storms. Salt is put at the bottom of the holes. In Ceylon the trees bend towards the sea. The fibrous net-work stem is so elastic as to cause a cannon-ball to rebound from it. The sugar or jaggry from it makes a very strong cement; 3 million pounds of coir were formerly made by the Dutch in Ceylon. In South America each tree yield a 100 nuts. The cocoa-nut flower looks, when closed, like a pod, but when cut open, the most beautiful wax-like flowers burst out of it. The cocoa-nut is so common in this country, that many pass it by without noticing the peculiarities of its

structure, and its adaptation to the country. We give an extract on this subject from *Archer's Economic Botany*, p. 69. *

78. PANDANEACEÆ.—Screw Pines. This order seems a compound of grasses and palms. The spongiolets of the aerial roots are composed of numerous very thin exfoliations, forming a sort of cup to hold water for the supply of the roots. The stem next the ground is very slender; higher up it is thicker, and sends out aerial roots, which seek the soil and act as stays upon the centre. The leaves are arranged like a corkscrew, numerous crystals of lime are found in the seed-shell.

Keyá (*Pandanus odoratissimus*).—In the Mauritius matting and packing bags are made from its leaves. In Cochin-China hedges are made with it, and its leaves are used for feeding tame elephants. Its flower is a great favorite with the Burmese. The stem is dichotomous, or having the divisions in pairs. The terminal leaf-buds constantly develope.

* The peculiar triangular form of the cocoa-nut has been pointed out as a special provision for its dissemination; thus, growing as it does frequently near the shores of the sea and rivers, its large seeds drop in the water and their shape particularly adapts them for sailing: one edge being downwards forms the keel while the upper surface, being flat, is acted upon by the wind, and propelled by it along the surface, until it reaches some coral reef, or shore where, being stranded, it vegetates and rises to be a magnificent palm, affording shelter and food in abundance. The coir and husk too, assist in this economy of nature: as the exposure to moisture, and the heat of the sun, are conducive to vegetation, and as the salt water would destroy the young plant if its tender shoot and home should be pushed out into the sea, a curious arrangement takes place, as soon as the shoot and root push out from the foramen, they take a direction towards the other end of the nut through the mass of coir fibre; this gives an increased weight to that side of the nut, which acts as ballast, keeping it downwards and under water. The coolness to which the shoot is thus exposed assists in keeping the vegetative power in check; but no sooner has it landed upon some congenial soil, than it throws out its strong roots, and soon renders a barren island fertile and verdant.—*Archer's Economy of Botany*.

The *Pandanus odoratissimus*, is famous among Sanskrit poets for its fragrance and is found every where in Arabia and China. The terminal bud is eaten as cabbage. Umbrellas are made of the leaves in South India: and in the South Seas, mats, cordage and hutting.

From the *Pandanus odoratissimus* is prepared a distilled water, gently stimulant, and promoting perspiration. Snakes are very fond of lurking in this plant.

Keya Kántá (Pandanus fœtidus).—The smell of the flower is very offensive. Such an abundance of crystals of lime are in the seed-coats of this family as to be seen with the naked eye. In Burmah a species grows near tide-waters, very useful for making mats.

79. TYPHACEÆ.—Bulrushes. Ditch growers, bear a close resemblance both to sedges and screw-pines.

Rám Hoglá (Typha angustifolia).—Leaves used for mats.

Hogla (Typha elephantina).—Elephant grass. A diminutive species of screw-pine. Used on the banks of the Indus to bind the soil together, and also as buoys to swim with. Fl. R. S. Grows in stagnant water. *Roots* stoloniferous, abound in starch, employed in the East of Asia in dysentery and measles. *Culms* glossy, pointed at the insertion of the leaves. *Leaves* sword-form, below, near the sheath, a little convex on the outside, concave within; used for thatch; no *corolla*. *Seed* oblong, carried about by the wind like the seed of the thistle, by means of the permanent downy fusiform calyx. Elephants fond of it. Anthers wedge-shaped. *Pollen* mixed with water forms a kind of bread in Scinde, Western Australia, and New Zealand, as also in Bengal; it is inflammable like that of *Lycopodium*.

80. AROIDEÆ.—Have no floral envelopes. In cold climates many are herbs which become trees in the tropics; many of them, when raw, have an acrid juice: Some of them in germinating give out a sensible quantity of heat, while

the emanations produce dizziness, head-ache and vomiting. The structure of their flowers is worth observing.

Mán kachu (*Colocasia Indica*).—A favorite in Indian curries. The root is used for swellings of the abdomen; reference made to its properties in the Vaidea work "*Drabea Gun.*" A variety of it, the *mán giri*, has the leaf-stalks of a darker colour; in Kartik month the natives in East Bengal worship Kalmi, Sashini, and this plant.

Gaj pippul (*Scindapsus officinalis*).—A parasite, the fruit is used in medic

There are others, such as the *kántá kachu*, *kántá mán*, but they belong to hilly districts, the former is a remedy in native diseases.

Shvet bach (*Acorus calamus*).—Sweet flag. A substitute for bark, the leaves are fragrant, and the root tonic and anti-febrile; given to children in cases of dyspepsia attended with dysentery. Linnæus observes that it is the only native aromatic plant of Northern climates.

81. CYPERACEÆ.—Sedge tribe. Might be called the "grass of the water." Distinguished from grasses by having solid, angular and unjointed stems. Their not having joints was known to the Romans, who hence invented the proverb "*nodum in scirpo queris.*" The order, though not handsome, has its name *Cyperaceæ* from the Cyprian Venus. 212 species are known in New Holland. A paper was made from one of this order—the papyrus—why may not others answer the same purpose? Sedges have not, as grasses, nutritive qualities.

Jál muti (*Cyperus pygmæus*).—Seeds three-sided.

Pāti (*Cyperus inundatus*).—Stalk exactly a triangular shape. It serves very much, like the bent grass in Holland, to bind the banks of rivers, which are overflowed by the tides: mats are made from it.

Chunchá (*Cyperus compressus*).—Many of the leaves are longer than the stalk.

Gol methi (*Cyperus seminudus*).—No leaves, eaten only by buffaloes.

Mutha (*Cyperus hexastachyus*).—Hogs very fond of the roots, hence the natives use them when dried and powdered as a perfume at their weddings and as a tonic and stimulant in cholera. The Sanskrit name for a hog is *mastad*, i. e., “the matha eater.”

Nāga muthā (*Cyperus pertenuis*).—Roots used by Indian women for perfuming and cleaning their hair, hence its name the *Nagar mutha*, i. e., “city or polite grass.”

Gol malanga (*Cyperus Roxburghii*)—Stalk sometimes twenty feet long.

Mādur kāti (*Cyperus pongorei*).—So well known for the mats made from its stalks; another of this genus, the *chāmāti pāti*, is useful for binding banks together.

Shvet Gothabi (*Kyllingia monocephala*).—Its fragrant root is reckoned an antidote to poisons. The exclusion of light turns plants white, but in this plant, when the heads are shaded, they are generally more green.

There are others, as these—the *chota gothuli*, *barithi*, *bara chuncha*, *behuyá*, *pāni molangá*, but there is nothing particular to note of them.

Keshár (*Cyprus kysoor*).—Indian bulrush. The roots are eaten in fever, and given as offerings to the deities.

Chencka (*Limnochloa plantigenea*).—Seeds beset with bristles.

82. GRAMINACEÆ.—Grass tribe. The name “Grass” is common to the Sanskrit (*ghas*) Anglo-Saxon, and Icelandic languages. Out of more than 2000 species known, scarcely more than one is really unwholesome. Cattle feed on the leaves, men and birds on the seeds. The cultivation of the various species of grasses is much neglected in India, though they are so useful in binding the soil.

There are many as the *shvet gothubi*, *keshori malangá*, *talnara*, *karatiyá*, *bara karátiyá*, *chunchu murmurá*, *pat*

patichenchaká, *bara keshoryá*, of which there is nothing particular to note.

Mayná or *Kodu* (*Paspalum stoloniferum*).—Seed used instead of rice. Cattle very fond of it.

There are others, as the *kangu junyá*, *chitrichirye*, *patinur*, *chota galgánte*, *chin ghás*, *baranda barethi*, *naradal*, *jupikangká*, *nákagáli j'lgánt*, *pongínachi bajrá*, *shonti ghás*, of whom nothing particular is to be noted.

Shiríya ghás (*Helopus annulatus*).—Flower cups very hairy.

Kangu (*Panicum Italicum*).—Called in Sanskrit *priyangu*, as its seeds are eaten by natives. It yields fifty-fold, and two crops in the year.

Dal (*Panicum stagninum*).—The stalks towards the base rest on the ground, and strike root, above erect for two feet. Flowers three-fold below above in pairs; fond of swampy ground.

Sámá (*Optismenus colonus*).—Seeds an article of diet. Yields fifty-fold; the *bara shámá* of this genus is made no use of; there is also the *dámrá shama*. At the Durga Puja festival the Hindus use the *shama* along with the plantain leaves and *bel* fruit to make the figure of a wife for Gonesh.

Juyár (*Sorghum vulgare*).—Indian millet. Its long awns protect the grains from the rapacity of birds; it yields a hundred-fold. Though the straw is thick and solid, yet all kinds of cattle are very fond of it. The *kála* and *sádhá debdhan* of this genus are also used for food.

Chorá kántá (*Chrysopogon acicularis*).—Persons walking in the jungles will remember this from its troublesome seeds sticking so much in the stockings, and causing itching.

Ulu (*Imperata cylindrica*).—After the first rain in May, the fields are white with this, which presents a beautiful sight; the whiteness is caused by the quantity of cereal that surrounds the insertion of the flowers. The Telingas use it in marriage ceremonies, the Bengalis for thatch.

Kásh (*Saccharum spontaneum*).—The great quantity of a silver-coloured wool which surrounds the base of the flowers, entitle this to its Sanskrit name *kásh*, or “the shining” a name for Benares also. Useful for mats, thatching, and as food for buffaloes.

Páti khári (*Saccharum fuscum*).—Native pens made from the stalks : also used for light fences and screens.

Uk (*Saccharum officinalum*).—Sugar-cane. Venetians imported it from India prior to 1148 : introduced by the Saracens into Sicily, Rhodes, Crete : its Sanskrit name *shakar*, the origin of its Latin and English names. It has been indigenous in Bengal from the earliest period, being a favorite present to the Gods, and used by native doctors for diseases of the chest and worms : given also as an antidote to arsenic. The process of claying sugar was discovered by accident, a hen with muddy feet having walked over a cooler full of sugar, it was noticed that where the clay from her feet had remained, the sugar beneath it was altogether cleared. The three principal kinds of sugar-canes in Bengal, are the *kajure*, or purple-coloured, growing in a dry soil, the *puri*, or light-coloured, and the *kullor*, or white, growing in swampy lands.

Teng (*Saccharum procerum*).—Stalks used for screens.

Shar (*Saccharum sara*).—Arrow-cane. Its long stalk of twenty feet, with the beautifully soft silky hairs of the flower waving in the wind, gave it the Sanskrit name *gundra*, “the playful,” and *shara*, “the arrowy.” It is often mentioned in the Puranas, the Indian god of battle, Kartikeya, having been born in a grove of it, which burst into a flame. The gods gave notice of his birth to the nymph of the Pleiads, who descended and suckled the child. Menu directed that the holy threads of the *paita* should be made from the culms of this, as being holier even than *kusá* grass. From the leaves tow ropes are made by the Allahabad boatmen.

Khaskhas ghás (*Andropogon muricatus*).—It is a fragrant grass. The Botanic name means bearded, *i. e.*, having a tuft

of hairs on the flower. An infusion of the root is taken in India to produce perspiration in fever; an ointment prepared from the root is also used to destroy lice. Used in the Decān for thatching' bungalows. *Bena* is the name of the plant, and *khuskhus* of the root. The poets have given nine names to it thus arranged in a Sanskrit sloke:—

Abhaya, nalada, sevyā, amrinala, jalāsaya,

Lamajjaea, laghulaya, avadāha, ishtakāpatha.

Sandha vena (*Andropogon schænanthus*).—Lemon grass; known by its smell, which resembles a mixture of roses and new mown hay. Useful in colds and head-aches to produce perspiration. The infusion of the leaves is esteemed by Indian doctors to be an excellent stomachic, and a substitute for tea; the natives of the Moluccas extract from them a pleasant essential oil. The young propagating shoots issue from the axils of the leaves. Leaves near the root bifarious: the fresh ones much used as a substitute for tea. Tonic, slightly stimulant; centre of the culm used to flavour curry. Sanskrit name *mālātrinak*, "grass-garland"—*bhustrinang*, "an earth-grass." Cultivated in Arabia, Ceylon, and the Moluccas. The Native governments so valued pasture grasses, that some of the pasture of the sandstone hills, south of the Kistna river, where the lemon grass is found, was reserved for their own cavalry.

Pāni shirā (*Hæmarthea compressa*).—Stalks very long and very thin.

Bākshā (*Rottbolla glabra*).—Grows in moist places near paddy land; leaves sword-shaped.

Makkā (*Zea Mays*).—Maize. It is the rice of Mexico and the United States. Indigenous to America, hence its name Indian corn. The pride and boast of American husbandry. Extensively cultivated in Egypt, Java, and Africa. It has a jointed stalk with alternate leaves like flags. The stalk are surmounted with a loose bunch, or spike of male flowers, of various colors, having oblong oval chaffy

empalement, opening with two valves, each enclosing two flowers. Seeds sometimes blue, green, red, or yellow. From each seed issues a filament, which when cut, the tree will remain barren. There are thirty different kinds, Sometimes fourteen feet high. Often *yields* four hundred per cent. The *Indians* of N. America used to sow it at the time a certain tree budded. A sugary juice is obtained from the *stalk*. The cause of the indigenous civilization of many of the Indian tribes. The spathe, or delicate elastic leaves, enveloping the grain in its head, is used for bedding. Named along the Dardanelles “reed wheat.”

Kanch gargar (*Coix lacryma*).—Called “Job’s tears.”

Bená Yoni (*Sporobolus diander*).—Flowers in the rainy season.

Páni durbá (*Sporobolus tenacissimus*).—Abundant in the West Indies.

Dhán (*Oryza sativa*).—Rice. The chief food of one third of the human race, hence well entitled to its Sanskrit name *vrihi*, “the spreader.” Forty or fifty different kinds of rice are known in India, and more than a hundred in Ceylon. Menu writes of rice wine, called *pishti*, *i. e.* arrack. Though a bag full of it was introduced into America only two centuries ago, yet it produced in 1850 more than 215,000,000 lbs. The *Santals* use immense quantities of a spirit prepared from rice in their feasts and religious ceremonies. The Chinese apply lime water to rice with great success; we know not whether that has been tried in Bengal. In North America the sowing rice in damp fields is very prejudicial to the health of the negroes, so also in Lombardy; it is not so in Bengal.

Durbhá (*Cynodon dactylon*).—Three-fourths of the food of horses and cows in India is made from this grass. Some of the leaves tapering very sharply, have given rise to the Hindu saying of an acute man, his “mind sharp as the point of a *kusa* leaf.” A cooling decoction is made from its roots by native doctors. Sir W. Jones says of its flowers “they are

among the loveliest objects in the vegetable world, and appear through a lens like minute rubies and emeralds in constant motion from the least breath of air." The ancient Hindus believed it was so beautiful that a nymph had taken up her residence in it.

Nal or Darma (Amphidonax karka).—Indian reed. The Greeks used to say that reeds had contributed to subjugate a people by furnishing arrows, to soften them by framing musical instruments, to educate them by forming pens.

Yaba (Hordeum hexastichon).—Barley. Native place unknown.

Gom (Triticum vulgare).—Wheat. Flowers in the cold season.

Kush (Poa cynosuroides).—Used in Brahmin ceremonies.

Báns (Bambusa arundinacea).—The cells and partitions are so large that they are used as cases to contain papers. The stem of all the grass tribe is originally solid, but owing to its diameter increasing more rapidly than new tissue can be formed, it becomes hollow. A flinty substance called *tabasheer*, or in Sanskrit *tvakkshirá*, is found in some female bambus; it is indestructible by fire, and is used as a tonic in medicine.

Tulda bans (Bambusa tulda).—Common bamboo. Thick shoots used for pickle; a thicker sort is the *piga bansh*, used for scaffolding, as the *bánsini bansh* is for basket-making, and the *behuri bansh* for a Brahmin to hold when invested with the páita, there is also the *bálku báns*.

CRYPTOGAMIAE.

Whose fructification is hidden, unknown, or irregular.

83. CHARACEÆ.—Aquatics; always submerged; give out a foetid odour. With a microscope the motion of fluids in them can be seen.

Called in English stone-worts from the lime in them. Their stems being encrusted with carbonate of lime may be of use as a manure; the abundance of this weed is one of the sources of the malaria of the Campagna of Rome. The fens in Cambridgeshire are adding year by year earthy matter in abundance from the deposit of *Characeæ*, which thus elevate the low, swampy soil.

Kantá Jjáŋghi (*Chara verticellata*).—Joints of the stems somewhat prickly.

Pátá Jjáŋghi (*Chara involucrata*).—Used to purify water and sugar: it attracts the filthy particles out of the objects with which it is connected.

Rasna Jjáŋghi (*Chara furcata*).—Said to cause rice to rot that grows near.

84. *EQUISETACEÆ*, or *Shave Grasses*.—A name they have from their flinty stems cutting the mouths of cattle; hence they are useful for polishing furniture.

85. *POLYPODIACEÆ*.—Ferns called *Dolypodia*, from having many roots. The ashes of some ferns form a potash used in making glass; the roots of others are sudorific. In Norway, Scotland, and Himalayas, ferns are cooked and eaten. Heat and shade are necessary for their growth.

In the Madras Presidency is a fern (*Adiantum melanocaula*) called *mayur shikhanda*, from the resemblance it bears to a peacock's tail: the *káli jjhamp* in Bengal is of the same species. In Jamaica, the same class are used for sore throats and consumption. The *veins* are all of equal size.

Chitua borá (*Polypodium glabrum*).

Garur (*Polypodium quercifolium*).—Abundant in New-Holland.

Dápu (*Polypodium proliferum*).—Root used in fever.

Chákulyeá (*Hemeonitis cordifolia*).—Used as a medicine in connection with native *pánchan*, or compounds.

Pánkánkrul (*Aspidium unitum*).—The *indusium*, or covering, is shaped like a buckler, hence its name. Forty genera known.

Káli Jhám̐p (*Adiantum leonatalatum*).—Called *adiantum*, or dry, from the nature of its stems, which, though you plunge in water, you cannot wet.

86. MARSILEACEÆ.—Creeping plants, living in ditches.

Susni shák (*Marsilea quadrifolia*).—Leaves eaten produce sleep, according to native accounts.

87. LYCOPODIACEÆ, or *Club Mosses*.—Derive their Botanic name from a fancied resemblance to a wolf's foot. Moss-like plants, with creeping stems and leaves, tile-shaped; they are a link between ferns and mosses. The *thecæ* contain a powder very inflammable, used in fireworks and in theatres to produce artificial lightning.

Sitáhár (*Lycopodium phlegmarium*). In the Sunderbunds chiefly.

Hátájora (*Lycopodium imbricatum*). Flowers in the rains.

88. MUSCI, or *Mosses*.—They have been called the corals of the tree. Dr. Wallich collected in India 148 different kinds of mosses, but very few are to be found in the alluvial soil of Bengal, and with no distinct native name.

89. HEPATEACEÆ or *Liverworts*.—Few in Bengal.

90. LICHENACEÆ.—Valuable for dyes: 2400 species known.

91. FUNGI, or *Mushrooms*.—The Ostiacks, a Siberian tribe, make a preparation from a mushroom (*Agaricus muscarius*) which will kill the strongest man in twelve hours. The Russians during their fasts live entirely on mushrooms, and are often thrown into violent convulsions in consequence.

Mushrooms develop their cells with wonderful quickness, one has been known with cells $\frac{1}{400}$ of an inch in diameter to have developed at the rate of 66 million cells in a minute, and continuing that for 12 hours: cells in aquatic plants are ordinarily $\frac{1}{50}$ of an inch in diameter. The old cell of *fungi* is transformed into a new plant by new cells originating in it and gradually taking its place.

The old Pandits so detested *fungi*, that they put in the mouth of Yam, the Regent of Death, the following words.

“Those who eat mushrooms, whether springing from the ground or growing from a tree, fully equal in guilt the killers of Brahmins.”

Twenty different species are known, but without distinct native names, all are called *bángcháttá*, i. e., “the frog’s umbrella,” corresponding to the English name *toad-stools*, and the Urdu *samp-ki-topi*, or “snake’s hat.” One species is edible, and may be distinguished by its being of middle size, the gills of a flesh colour, changing as they advance to a chocolate, and of an agreeable smell.

Korak (Agaricus edulis).—Eaten by natives when boiled in oil: the widows of Brahmins and Khayists, will not eat this fungus, from a notion that it springs from stolen meat buried in the earth.

92. SALVINIACEÆ.—Floating plants, with reddish stems. Order named after a Professor of Botany at Florence.

Páná (Salvinia imbricata).—Flowers in the rains.

Indukáná páná (Salvinia cucullata).—Leaves shaped like rat’s ears.

Táká Páná, Ulki Páná (Salvinia verticellata).—Its name *ulki*, means “a Hindu sectarial mark on a woman’s forehead,” which it resembles.

Correspondence and Selections.

PARTICULARS REGARDING CERTAIN SPECIMENS FORWARDED DURING 1858-59 FOR THE GARDEN AND MUSEUM OF THE SOCIETY: WITH NOTICES RESPECTING THE FLORA AND VEGETABLE PRODUCTIONS OF UPPER ASSAM.

(Communicated by Capt. W. H. LOWTHER, 2nd in Command Assam Local Battalion.)

If you will believe me, I will tell you that I have been working in behalf of our industrious Society as zealously as a honey-bee for the hive. Since the commencement of October I have been scouring the entire Suddyah frontier in pursuit of marauding Mishmees, and at the same time "opening up" (*America*) the vegetable treasures of the "great eastern wilderness" (as I always style my locality). If there be one remarkable feature in the botany of our valley, it is that of monotony; for whole days together you will often see many thousand specimens of *Mussaenda*, *Thunbergias*, *grandiflora* and *coccinea*, *Asclepias curassavica*, and many equally common plants without novelty: but it so happens that, occasionally, some rich or rare denizen of the mountains is transported by landslips, or torrents, to the shores of our great rivers, where the stranger deposits itself, and exists. Under these circumstances, far up the Dehong, I was so lucky as to discover a floral treasure, which will certainly prove an acquisition to the parterre (if new, as it is to me), recommended by hardiness, height, beauty, and fragrance. I will not take upon myself to classify this beautiful shrub, which is gaudy as an *Ixora*, and sweet as a rose: dried specimens are seasoned for an opportunity of transmission. *Description*—habit, trailing; stems, 3 or 4 in. circumference, leafless for 7 or 8 feet, then suddenly expanding into delicate branches; leaves rich green, glabrous and abundant; the bloom in a mass consisting of terminal corymbs, delicate rose color, and as sweet as *Echitès caryophyllata*; altogether, it has the habit of an *Apocynum*. There was but the one vigorous specimen, and this I divided piecemeal into herbarium samples, cuttings, and rooted stems; the latter but two in number: and, owing to the present cold, I cannot tell you more than that they are alive: of the old wood slips nearly all have failed, as expected, but of a few terminal

shoots I have been so fortunate as to strike four, this, by the aid of a hand-glass, and much attention. I have also obtained for you root and branch, as above, two remarkably beautiful *Acanthaceæ*, viz., a *Justicia*, with rich blood colour, or lake whorls of flowers, and a *Ruellia*, with delicate crimson bugles (similar to a *Russellia*) both frequenting the darkest and dampest portions of the forest, and, therefore, *tender*, without doubt, as garden flowers, but your garden will do well enough for them. Two other *Justicia* I shall send you are medicinal bitters of much value: the larger, coarse, with whorls of white bugle blossoms, a fine aromatic, used by the Border Kampteas in their fermented liquors, just as we employ hops; the other and smaller plant has a dull scarlet or red inflorescence, giving it a weedy look, and it is common enough in all woody places: used as a *sâg* by the Assamese, and as a bitter tonic by Europeans.

The first mentioned one is, I think, *not Maha teeta* of Bengal, though allied to it. This plant seems to possess great attractions to the wild bison, and it is difficult to find one which has not been bitten within the circle of their haunts. I have not been very successful in obtaining seeds; in my various jungle travels I undergo the anxieties of Tantalus, for all the hanging fruits, pods, and capsules are either green or empty, or decayed. I was priding myself on a gigantic follicle, of cucumber dimensions, the offspring of some superb *Asclepias*, picked up amid the boulders of the Dehong, when, to my disappointment, after two months' anxious examination, it burst, only to disclose several score of fine seeds in a fermented state! I have obtained for you another delightful garden plant, *Labiata* allied to *Ocimum*, an elegant under-shrub, with all the aromatic qualities of that family; and a mass of rose-colored bloom, highly attractive, from its spicy odour, to the surrounding colonies of bees. The specimen is perfectly hardy, no doubt, though it was solitary. The cuttings have all perished, but the main root is alive. Of orchids I commenced a wholesale harvest, but have since discontinued for want of water carriage—neither steamer nor country boats to be had. I shall send you sundry seeds by *dâk banghy* at times, and some cuttings perhaps by the same method; but boxes, cases, or baskets, alas! Now to fruit trees: with some difficulty I have managed to accumulate for you a few seedlings of *Pierardia sapida*, *Garcinia pedunculata*, and *Placourtia cataphracta*, nearly all self-sown, of these three stubborn and delicious trees. I have also set about procuring for you a rarity, the wild leechee of the Naga Hills, known to me only by description, and evidently needing but the gardener's art and a good locale (Bangalore and Deyrah?) to render it a first-class dessert fruit: Assamese

name, *Naga F'enga*. For the last named *desideratum* I am specially indebted to Lieut.-Colonel Hannay.

I have been very successful this season in rearing your American assortment of "squashes:" they could not be finer in their native country. I am in great hopes I shall be able to send you enough acclimated seed for general distribution, with hints for the culture of this most excellent class of vegetables: the bush squash in my garden would surprise you, each small erect plant is bearing ten to twenty delicious gourds, of which two or three are nearly ripe. The large and trailing sorts are all covered with produce also, but they will not come into table use for a very much later period. I have just obtained in a late overland packet some seeds of the new *custard marrow squash*, so highly praised by Professor Lindley in the *Gardener's Chronicle*—they cost beyond their own weight in silver, *i. e.* 6d. per seed: I wish they had arrived with your Squashes in September, for I cannot now sow them till February. I have also obtained, by the same opportunity, the still more costly seed of *Passiflora tacsonia ignea*, the most dazzling of all that gorgeous species. We have *Modecca palmata* (the large tuberous *Passiflora* of our old forests, with fine green foliage, and large buff white flowers). Do you want any? I shall be able before very long to give you some practical hints on coffee growing: besides my old stock, I am now planting out, in this fine foggy season, some 400 more seedlings of sizes.

I find the *Khamar* a very scarce plant; rather local I should say. Dr. Pyster of the Naval Brigade has tried it with success, but he found the same difficulty in getting a good supply of leaves. I am propagating the plant both here and at Suddyah, and shall in time get you a lasting quantity of the same for distribution. It is *not* identical with the dye *Ruellia*, but I have not seen either in flower; as far as appearances go there is a mere alliance. I send you per dāk banghy a small pot of boiled juice, inspissated to the consistence of an extract, and slightly impregnated with turpentine, as a precaution against decay. I have no doubt it will be found to possess the concentrated virtues of the fresh weed in the cure of therapeutic, and other eruptions so peculiar to Bengal. I also forward a small specimen of *Chanda teeta* root, furnished by a pretty little (*Ginchonaceous*?) plant, with coffee-like leaves, and pale terminal inflorescence. The demand for this drug by the Assamese is much greater than the supply, and (except in one spot, amid the Muttuck forests,) I always observed that it had been carefully preserved and planted for officinal use. At Suddyah I have frequently sent out for miles without meeting with it, for indeed, it seems to be the popular

panacea for everything, from jungle-fever down to the itch ! I can speak from experience of its tonic properties *internally*, and its specific curative effects *externally*, and I think I have long ago noticed the plant in a letter. It is a penetrating bitter as you may suppose, not much unlike fresh *Gentian* in flavour. According to the Border Kampteés the *Room* plant is not actually indigenous to Assam, wherever plentiful, there are usually the vestiges of former Kamptee, or Singpho settlements. The use of lime in the dye has the effect of rendering the colour almost *black*. I have some worsted so prepared. The wood ash formula seems conducive to real good *blue*, of the dark military shade. I forward a few seeds: No. 1 taken from the potato-like fruits found in a large forest tree near the Upper Burrampooter, said by the savages to be *edible* when ripe. No. 2 from a delicate leguminous shrub, resembling an *Indigofera*, but I have not seen the flower. No. 3, great bitter *Justicia* of the Kampteés. No. 4, lesser white bindweed, the character that of *Ipomœa rubro-cœrulea*, but flowers are smaller, snow-white, with yellow centre: requires shelter and shade of a forest tree. There is a very fine larger variety, not yet seeded; both common in our jungles.

The mustard crop of this year is a failure in Upper Assam, caused by too much rain at sowing time, and *too little* during growth; with me it flowered when scarce out of the soil ! But my two kinds of Bengal wheat, provided the creatures of *feræ naturæ* will spare them, are most promising, and I am reckoning on eating cheaper bread than eight for the rupee. I send two tubers I just picked up in a clearing in the forest; I think this is the above described *Modecca*.

Bee-keeping is decidedly profitable in Assam. I was surprised when I entered the valley to find the custom unknown. In Kumaon, Nepal, Cashmere, and along the whole N. W. Himalayahs, I observed these insects carefully domiciled; while in Assam the numerous species are only seen in their aboriginal state. Wild bees are abundant in the forests. The best kind seems partial to the abodes of man. I have seen a heavy comb attached to the bottom of an *almirah*, in a *bed-room*, much to the fear of the inmate; that circumstance led me to waylay and ensnare a young swarm on the wing from the above birth-place, and I have since added two more swarms to the "*Apiarium*" constructed of beer chests, under lock and key, in a coal godown. I intend to put some of them into a glazed case soon, so as to learn more of their habits. You know the modern plan of "*chloroforming bees*," I suppose, by which *not one is killed*, and a *child* may take the honey!—*Suddyah, Upper Assam, Decr. 29, 1858.*

The red flowered *Til*, I am sorry to say, has disappointed me at the last stage of growth;—our heavy rains suit its flowering and increasing properties well enough, but then succeeds the great check of cold fogs, and weak sunshine, just at the ripening period; the pods externally look healthy and swelled, but the seeds are little, more than husks. I have a promising patch of maize just now from your American stock, grown one season at Debrooghur. I am putting your late bestowals into the soil as fast as I can. I shall soon send you a few seeds of a most excellent native bean, brought by me from Upper India originally; it is a most prolific vegetable, and unsurpassed at the table by any European or Asiatic species I know of,—however old it may be, yet it boils tender; it is as succulent and well-flavored as squash, or asparagus; Hindoostanee name *gheea seem*. I intend to send you an account of my squashes by-and-bye. I do not see this vegetable mentioned among the good things of your shows. How is this? Is it too common, or is it a failure? Nothing can surpass the luxuriance of the whole tribe in Suddyah, their fecundity is as remarkable as that of the Tomato. The *bush squash* is a great favorite here, from the little room it occupies, and the great supply of food it furnishes. I cannot supply the demand for seed and, unless I can ripen some of my own, must monopolise the growth. Have you a cold-weather cucumber in Calcutta (I mean *bonâ fide out-door*, of course,) we have in Assam? I sliced up four of some 6 or 7 inches long each, on Christmas Day, from a native garden. I have also three or four large plants (from what seed, I do not remember) now growing in Suddyah, but they show no signs of flowering at present. This reminds me what a service you will do Assam, if you will undertake so much trouble as to get me all the *Cucurbitaceæ* of Kashmir, the *Brassicæ*, and Tobaccos—all eminently fitted from their aquatic habitat (especially the first-named from the floating gardens) to our mild and moist cold season. I remember two kinds of *squash*, three or four *cucumbers*, the best a long, slender, rich green-coloured vegetable, a famous large melon-like. The *Surda* is a small unmatched water-melon, with deep purple flesh, as sweet as sugar, and as cold as ice. The turnips, called *gbogloo*, rank among the best flavored in the world. There are two or three kinds of Beans well worth getting. The *China Asters* are very fine, indeed, and as common as the earth they grow upon; name *gool kuthdi*. The Cabul *Surda* melon seed is brought down also to Lahore and Umritsur, and I think would grow here as well as it does out of doors in *Ireland*, where a friend of mine brought them to a quality and weight not inferior to those of Cabul, *viz*, nearly 4 pounds in weigh, sweet, and crisp!

I yesterday sent you by dāk three small packets, one of that large white *Ipomæa*, one of white Pulse, one of black mixed do, (both used green as a vegetable by the Border savages, and also as dhāl when dry.) Local name *miri māl*, or the *miris lentil*, a pretty glycine-like creeper of tall growth. I am particularly anxious to introduce here all such tuberous edible roots as are suited to a deep sandy alluvium, with water near the surface, *i. e.* potatoes from all parts, yams, Jerusalem artichokes, &c. &c., also every kind of spice plant, such as West India ginger, capsicums, &c., and also sugar-cane, which here attains a magnificent growth and quality. The very best citrons I ever saw were growing wild last month on a barren island (of nearly pure sand,) of the Upper Berham-pooter. I should not be believed if I told you the probable produce of that one bush: and its growth was very remarkable for any plant in *Aurantiacæ*, the lower branches trailing creeper-like along the ground, and heavily laden with bunches of ripe perfumed fruits, some weighing more than 2 lbs. a piece, of which I have converted several into candied citron, and can vouch for their delicious flavor. I carried off, besides, as many rooted offsets and shoots as I could obtain, and they are now mostly thriving in my orchard. Would you like to get a specimen of this variety for your garden? It is possible that it may be an improvement on the old kinds: the deep white sand is all it seems to want for its welfare. I am most anxious to get everything in *Aurantiacæ* worth growing, and am devoting a great deal of land in my Debrooghur garden to that particular class of fruits; the China peach (*flat*), and some good plums I shall also value, if you can spare any.

I am just now "hiveing" a large swarm of another kind of bee, a large reddish-brown, and fierce looking, quite different from my two species at Debrooghur; it is decidedly domestic, though, having swarmed spontaneously inside my bullock shed, and even permitting men and animals to walk close under the colony: my large mustard cultivation seems in all instances to have been the bait of attraction, and I recommend all bee-keepers to grow a patch of this, and the two or three kinds of *Ocymunt*, as food for their insects. The common *toolsee*, you are aware, is the plant of which the leaves are used by the gardeners of the N. W. Provinces to rub on their hands and faces when taking honey-combs, and alone constitute the vaunted charm of these apparently magical gentry! The metamorphosis of a lovely nymph into the *toolsee* plant, to escape the persecution of an amorous god, as sung in Indian poetry, doubtless first gave the superstitious mallees an idea of its soothing virtues.

I shall from time to time send you brief notices of our Assamese trees, plants, and flowers, after the manner of the Rev. Mr. Long in your pages, as I have no doubt some of the readers take an interest in these subjects. I shall soon be enabled to send you any quantity of seeds of the large and handsome tree "*Monkey's grief*," and which Colone Hannay tells me is *Careya arborea* (?) if so, is *Careya* abundant with you—or the reverse? I can send you seedlings, too, if desired, when the good days of "Wardian Cases" return to us. *Suddya, Upper Assam, January 19, 1859.*

•I lose no time in sending you two tubers of that handsome edible cucumber (of which you received seeds), *i. e.*, because the Assamese tell me the really good kind for the table is alone to be ensured by these means, and that *seed* is not to be trusted. Also, I send tubers of a very pretty fragrant little orchid (white) common in our low marshy grass plains.

Seed of a pulse used much by frontier savages, and suited to your Bengal cultivation,—also sending other seeds to fill up the little box.

We have had heavy rain, and my wheat is really splendid for a Bengal crop, more than 5 feet high, full in ear. I believe this is the most N. E. point of her Majesty's Indian territory in which it has ever been grown. Most of your maize, too, is above ground, but, as I wrote you, the other seeds have arrived too late.

The *Hulluck* and other perishable seeds I of course transmit per letter.

Hulluck of Assam is a *Terminalia*; of fine, tall, straight, durable timber growth: for common carpentry excellent, and even as a canoe, lasting five years, or more. Lovely when in blossom; one mass of deep rose, or carmine red tiny flowers;—no larger than these seeds,—grows in the vicinity of the great rivers on alluvial soil,—chiefly composed of sand and vegetable deposit. Forests with a dense under-growth seem necessary to its primary increase, and then it speedily overtops and overshadows every thing in its vicinity; ought to do in the greater part of Bengal,—and if not too near the sea.

The large creeper, *Tenga gootee*, looks like a *Smilax*, but not having seen it in flower I cannot speak with certainty; grows on the edges of forests' streams, clinging to the bank reeds, or grasses; berries used throughout Assam as the natural bait for the better kinds of fish, which seem in those localities of its growth to care for little else. I have a number of magnificent terrestrial orchids (3 or 4 feet high,) planted ready for you: these superb plants are only to be found in the most dark and unhealthy forests, and I have therefore availed myself of this dry, healthy period to collect them. You will certainly have to

make a jungle in some wet, dark corner of those picturesque gardens, to meet the *shy* nature of many of my donations.—*Suddyah, Upper Assam, February 6th, 1859.*

March 2. The Great Dihing River, Abor Expedition.—Just a few lines to say that I got your's anent the Munjeet seed a few days ago, and that I lost no time in writing to a friend on the Naga frontier, with the view of obtaining some, if procurable, (if for loan, barter, or money). There is little or none on the Suddyah frontier, and that little is a wretched woody kind of stuff, containing but a minimum of colouring matter. The Naga product is the best I have seen in Assam, but I am told the Bhote frontier (Durrung) furnishes the quantity A 1. I know very little of the subject, so will not trust myself to any further information. I will try and assist you if I can, through Native agency, in procuring seed also from the last mentioned locale. I send herewith three seeds of that pretty shrub wild coffee, which I first noticed as a jungle plant on the Goalparah hills, subsequently in various parts of Upper Assam, and very abundant indeed, where I am just now encamped, on the undulating shores of the Dihing, in a densely wooded tract; the soil, stone, sand, and alluvium.

March 20, Suddyah.—I only returned yesterday from the 'seat of war,' having stayed behind the force for a few days to construct an entrenched post, where we have left a small detachment temporarily to prove to the savages that we intend to 'hold our own.' While engaged in stockading, I amused myself with collecting a few seeds for the Society, and send you herewith a small lot of the *Koroi acacia*,———? the most valuable of all timber (next to teak) to the Engineer and Railway Mechanician, nearly *as hard*, almost as durable, and as *enormous*, and indeed in every way the most desirable as a forest tree of all our indigenous woods. It prefers the alluvial *churs*, the seedlings being nurtured in the dense moist shade of the giant grasses, and rank vegetation of such tracts. We have had so much *unseasonable* rain that I can send you but few sound seeds of *anything*, blight and decay having made sad havoc. I shall, however, be able to transmit another packet or two of sundries very shortly. I collected about a pound of ripe berries of the wild coffee, and had the curiosity to roast and make a *brew* of the same. The powerful medicinal bitter flavour of the decoction forbade my drinking much of the same; it was two *cinchonaceous* by a great deal. The savages of South America, I believe, employ it in the cure of malarious fever in preference to the indigenous bark of *Cinchona*, so precious in our European practice; *probandum est*, I say, and you can have as many young plants and seeds as you choose, to ask for, in the event of your garden not possessing it already.

For a shrubby hedge it is decidedly elegant and desirable, and seems, too, most hardy.

This dreadful thirty days' rain has done for a great deal of horticulture and agriculture at Suddyah, and I can only boast of my "Squashes", a dry March would have made me triumphant with that vegetable, and I must now remain content with a *fraction* of my previous hopes, *viz.*, some—

"Early Bush Squash" (ripe), weight 5 pounds, full of perfect seeds.

"Cocoa Squash" (ripe), weight 11 pounds, full of fine mature seeds as good as those from America.

"Marrow Squash" (ripe), weight 9 pounds, ditto ditto, as above.

Warted Squash, 2 or 3 lbs weight (ripe), yielding only a very few seeds, but these ripe and perfect.

Other squashes (various) from ten to five pounds weight—seeds not yet examined. I would like to have sent you a basketful if we had *Steamers*. I have been most anxious to acclimate this particular class, of vegetable, it being essentially a "poor man's provender" from the productiveness of the plants and small amount of land necessary to grow them. I need hardly tell you that I am beset with applications to furnish the seed—and, indeed, I have been robbed at night of sundry fine ripe specimens.

March 20th, Suddyah.—You will get a small box very shortly with the squash and other seeds, which in our very moist climate I have dried by the very gradual sand process, and which method I recommend to our European importers; the final stage should not exceed *blood-heat* in canvass bags, to enable the operator to prepare any amount without admixture.

I am now reaping my Bengal wheat; in spite of a month's rain and mist, the ears are full and sound, and the crop an excellent one altogether. Some Mishmee savages who saw it, tell me the Ber Abors have similar grain (obtained originally from Lama), and I have directed them to bring me down samples. The same party have brought me a small parcel of *Munjeet*, and I have promised them a fine donation of *country liquor* (the omnipotent key to the savage heart) if they bring me two handfuls of the seed. This they have promised to do, but it does not ripen till October or November, so they tell me. I think I told you that I have written for a small supply to the Naga frontier, where great quantities seem to be produced. I am also trying the *Bhootan* gardens, but here I do not expect success: the whole Thibetan frontier is excessively jealous of its exports, so much so, that they sell only male animals at their fairs, lest we might breed from their stock.

Nearly all the *Cereals* you so liberally sent me were riddled by "Weevils," and I fear two-thirds will not last till next season. Here I beg to suggest another small hint. Import all your agricultural seeds in the *natural* protection—the *husk*. The natives of Upper India are fully aware of its advantages, and you will see their stock of maize, seed, wheats, &c., suspended in bunches from the cottage roofs, in which position, too, they receive ventilation, or *smoke*, the two main preservatives. The bulk of package is a very secondary consideration, I think, compared with the loss of a whole season's sowings, and the consequent disrepute of European seeds among the natives. "

A large percentage of your sorts (American maize) germinated famously, but that farmer's curse, the "Mole Cricket" (*Gryllotalpa*), has devoured nearly every one of some kinds, and more than two-thirds of others: this minimum produce, however, is remarkably fine; both soil and climate are well suited to the growth, and I am daily receiving applications from the frontier savages to give them seed. I find that the middle of December is the proper period for sowing this description of grain, but your box arrived too late, and I had only a supply raised from home acclimated (American), wherewith to try the experiment. Of this batch not a plant was eaten, for the abominable insect seems to hibernate, and to that circumstance I attributed my promising crop of the cold season's sowing: it is now entirely covered with green "Cobs," some of them full a foot long. Your Grass seeds are now germinating well in the trial gumlows; "Red Clover" and "Lucerne" the fourth day from time of sowing. Are these two acclimated? You may judge of the legion-like voracity of the mole-cricket, when I tell you that in the eighth of an acre a digging party of boys earned in two days nearly 3 rupees, at 6 *crickets* for the pice.

I found this experiment so expensive and so ineffective, that I have abandoned it, and must look to other modes of extirpation, which I will duly report to you. Their subterranean habit, descending to three and four feet, and only feeding by night, render these pests as bad as locusts, and they breed incredibly. Nearly all my fine annual cabbage plants, seedlings, shrubs, capsicums, tobacco and ginger, indeed, three-fourths of everything, have been nocturnally chopped to pieces, and dragged into their burrows, and I have been all but disheartened by their attacks.

The country people of this district are compelled to shift their cultivation from time to time through the above cause, for the more you clear the surface of the soil, the more do these pests multiply and devour: on lands covered with rank vegetation, or high jungle, they do not remain, but shift to the open plain, for some delightful reason of

their own. The sun kills them instantly, and they die very soon after you bring them to daylight, so that I think a heavy sub-soil cultivator, suited to elephant draught (or two pair of large bullocks), might possibly annihilate them; and once above ground they form a favorite food to all manner of birds: indeed, when full grown and winged, to the Assamese themselves, who relish them, as we English do our *prawns*. At Debrooghur they are comparatively scarce, but that does not mean *few or far between*, or *harmless* exactly. I have collected a few more seed for you; among them a lot of *Hibiscus (fragrans;)* a small tree common to our jungles, flowers on panicles, delightfully fragrant of honey and most attractive to the wild bees:—the fibre excellent for string purposes: the Assamese name *Bun Kupas*, literally jungle cotton, but by this name they call two or three other plants of the same order, and cause confusion. In no country of the world do there seem to be so many fibrous substances and I am collecting specimens of these particular products for transmission to Europe, and you can have the duplicate if you wish. The *Oodal (Sterculia)* I find the most generally useful to me as an agriculturist, and shall send you seeds in season: elephants and wild buffaloes are snared with the cordage of this fibre, so you may imagine its great strength: I use the fresh strips for all purposes of Basts and the tying of fences and enclosures; I find the tree furnishes just now a fine white gum, which seems sufficiently adhesive for common use. Some of the Allumdie Mishmees have brought me down bags made of a jungle fibre which I will ascertain; they are made to hold small supplies of grain, salt, &c., as required by these wandering people. I will send you one with the "Munjeet." Those large terrestrial orchids from the forest seem to stand removal and exposure famously, they are all now flowering on an open spot, in spite of the foliage having perished, although the spikes were almost in bloom when the plants were transmitted. The unusually heavy rains, perhaps, have contributed to preserve them.

My mode of packing bulbs, tubers, &c., by overland. If only a few very choice kinds, put them up with proper marks tallying with the letter of advice in small canvas bags (*carpet-work canvas, like a sieve*), prepare a light pasteboard box with tightly fitting lid (an old envelope case I found excellent), punch holes in this on all sides, half a dozen altogether, with a common hole punch for leather, then pack the little bags in dry sawdust, or old moss, sewing up the box in a piece of coarse linen, attaching a leather label for the direction. Out of the above 8 tuberose bulbs 7 reached me at Suddyah in a sprouting state, although they had been delayed in Calcutta for a month or two, they

were certainly not less than four months on the long journey from London. Seeds' also forwarded in the same manner have always reached me in great perfection, nearly every one for the last ten years has germinated, but the bags are usually put up in letters, and are made of coarse gauze for lightness. I never lost but one packet, and that arrived in the midst of the cold weather rains, a mass of mould and rotteness, the result of some smoking peon's "hour of idleness," no doubt. Cuttings of fruit trees were sent me at great expense, but all packed after the prevailing fashions entirely failed. Doubtless a large Society like ours would find it best economy to have a Wardian case tightly packed with as many cuttings as it would contain; the more together the better, perhaps, for their freshness: a neat work of wire effectually guarding the case from any accident *en route*.

March 25th, Suddya.—Many thanks for your last despatch and the promised seeds, &c. I am making you up another dâk packet of newly ripened seeds, *viz.*, the arboreous Hibiscus? (*Hibiscus fragrans*), called here, like many other things of the same order, *Bun Kupas*: this small tree furnishes a good fibre, its flowers are beautiful, and are the favorite resort of all bees; cultivation would doubtless improve it. In certain localitiës it forms a small forest. I also send you a few seeds of a shrubby URTICA-looking thing, perhaps a wild *Morus*: this also seems to contain fibrous material, but is mostly remarkable for the fine fiery hue of its orange fructification, only seen in the most dense forests.

I have also obtained for your Museum, grain bags and striped canvas said to be manufactured from *Urtica crenulata*, called here *Sir-nat*. It ought to be named, I think, "*Travellers' Terror*," for often in forest excursions man and beast suffer fearfully from its stings; the inflammation lasts for days together, and the slightest touch of water to the part gives a sensation of hot iron or hot oil! The other and less venomous nettles, called *Bichoo*, literally "*poison touch*," are also used for the same purposes. The above fabrics are brought down annually by the "Cropped-hair Mishmees" of the Dehong, as also are some very prettily designed cotton pieces of a coarse web, used as clothing, jacket, &c., by the Assamese; you will get samples of all these by-and-bye. I am also preparing a little twine of the *Bun Rhee*a, or indigenous *Boehmeria* of our forests, rivalling the *Sir-nat* in height and size. Lastly of *Pæderia fatida* (*Rubiaceæ*). Assam could turn out millions of tons if required to do so. From the Gowalparah district to the foot of the Abor mountains, high up the Burrampooter and Dihing, this weed forms the chief undergrowth of the jungles, and constitutes

a natural network of creeping foliage, rendering the advance of any human being on foot an *impossibility* ! Elephants, their riders armed with the *dáo* or north-eastern war-knife, are the sole pioneers on such occasions, and even then the progress is but slow and uncomfortable, while the odours from the bruised *Pæderia* are perfectly in keeping with its classical epithet. I am sending you a few seeds for trial, but I suspect the Sunderbuns have more than enough to spare. I will dry some specimens when in flower. Our Assamese orchids begin to look lively. I am thinking, some of the rotten old trees, just now sparkling with these floral gems, would startle the Londoners if suddenly sent to Covent Garden market ! That fine one allied to *Dendrobium cærulescens* will shortly bloom in all its grandeur on the Mishmee war-path, where none but the well armed backwoodsman dare venture to view it, and it is so with most of the finer and rarer kinds which “waste their beauty on the desert air,”—“and die with civilization,” as I said to myself on seeing a clearing lately opened out near the military road, where numerous felled trunks covered with dry orchids lay ready for burning. I have been timber-hunting this last cold season in the beds of both the Burrampooter and Debong (the Dihing which holds all the finer kinds is just now an enemy’s country). In the first named I found a profusion of superb pine,—*Koroi acacia*,—and many other very useful and durable kinds, all in drift, and evidently of great age. On the Debong I found some noble growing specimens of *Cedrelus toona* and *Terminulia*, &c., &c. The Bonger Abor savages of this river also brought me down 2 magnificent canoes, one of *Lauras sassafras*, 40 feet long, and one of a beautiful *Cedrela*, much smaller : the wood of this latter was exquisitely veined, and marbled like mahogany : I much regretted that such valuable wood had been sacrificed to so common a purpose. The *L. sassafras* timber is so highly valued that I had to pay Rs. 44 for the large canoe, and it was considered even in the jungles as dirt cheap. I have just finished raising a splendid tree from a quicksand of the Koondil, (our Suddya streamlet of Hindoo classical fame,) it cost me a lot of personal superintendence, and four days’ labor of sundry carpenters and coolies : not until I dammed and diverted the river did I succeed in chopping the giant into four pieces, and pulling them out with ropes and levers ; this mast-like log was straight as an arrow for more than seventy feet, and for a third of its length four feet in girth, the color bright yellow, on cutting, but changing to dark brown almost immediately : grain very close, handsomely veined, fibrous, tough, and elastic, and evidently some *Terminulia* (perhaps allied to *Bhola Terminulia*). But few of our native woods are elastic,

and I had long sought in vain for such a quality. The Assamese here call it "*Hukun*," and say it drifted originally from the Mishmee Camer Range, which is its habitat. I am busily engaged in preparing a collection of woods for the Museum at Kew, in conformity with a circular I lately received from Sir W. Hooker; also one of fibrous plants, and their products, dye-substances, and drugs, &c. This is necessarily a work of time, but I shall manage it gradually by instalments. Any woods which you may not already possess, I shall be happy to give you. It is a pity that "*Xylogy*" is not better conducted. To render such samples of value, the respective specimens of timber should be accompanied by dried foliage, both in bloom and in seed, to prevent doubts and manifold mistakes. I much fear your liberal despatch of maize arrived too late for any produce, this sultry weather is forcing several of the young plants into premature flower, while those (from acclimated) mentioned to you in my last, as sown 15th December, are in famous bearing condition.

I was much amused the other day in my village rambles by a vegetable curiosity, "a family tea plant;" now I will explain. On a sandy chur of this vicinity there dwells an Assamee zemindar who, among a general collection of fruits, pot-herbs, and greens, has a solitary bush, and a remarkably healthy one, of *Thea Assamica*. This individual and his numerous progeny delight in washing down their opium with a cup of the harmless beverage, just as the Chinese do, and they gather the leaves as they require them, merely putting them through an extempore process of hand-rubbing, drying, and boiling, and strange to say that the aforesaid plant is thriving, and covered with nice young leaf in spite of the greedy gatherings in the sandy soil! There is a considerable plantation near me of the *room* dye plant, belonging to a small colony of Kangongs, a border race of Kamptee descent, and they are now dyeing some blankets for me both European and Thibetan. With these people, both male and female, *dark blue* wearing apparel seems to be the prevailing colour, as with their neighbours the Chinese. I observed the other day in the head-dresses of some mountain Abors who came down to me, a plume of goat's hair of brilliant orange colour, evidently dyed with *munjeet*, as are the common scarlet ones usually worn by these people (the Nagas), and was told they procured all these from the Lama country.

*On the Mammoth-tree of Upper California: By BERTHOLD SEEMANN,
Ph.D., FLS.*

When, at the conclusion of the Mexican war, Upper California was ceded to the United States of America, a report that the newly transferred territory was teeming with gold suddenly changed lonely forests into busy mining districts. Exploring parties of adventurous immigrants spread over the face of the whole country, and many a valley and creek never before trodden by the foot of the white man was visited, in hopes of reaping there an abundant harvest of the precious metal. Stories of most wonderful discoveries soon filled every newspaper, some of which proved utterly fictitious, while, again, others seemed to bear out the old adage that "truth is stranger than fiction." But, as often happens, fiction was in many instances implicitly believed in, whilst the sober truth was absolutely rejected. Among the statements which shared the latter fate, was that of an adventurous Californian, who, penetrating into the recesses of the Sierra Nevada, had met, near the head-waters of the Stanislaus and San Antonio rivers, with a grove of trees, rivalling, if not surpassing in height, the highest buildings in the universe. So little, indeed, was it believed, that even the name of the discoverer is not known, unless we accept a Californian tradition, which points to J. M. Wooster, and is so far borne out by actual evidence, that there exists on one of the trees, now termed "Hercules" by the people, the inscription of "J. M. Wooster, Ju. 1850." Soon afterwards, this extraordinary grove, which henceforward obtained the name of "the Mammoth-tree Grove," from the vegetable giants being called the "Mammoth-trees," was visited repeatedly, and the accuracy of the rejected statement was ascertained beyond a doubt. Strangers from all parts of the country now thronged to the place, making it quite a fashionable resort of Californian society, and inducing Mr. Wm. W. Lapham to establish there, as early as July, 1853, a hotel, with all the comforts the nature of the country would admit of. About the same time Mr. William Lobb, the botanical collector of Mr. Veitch's Nursery at Exeter and Chelsea, visited the grove, and did not fail to procure leaves, cones, specimens of the wood, and an excellent sketch of one of the trees (drawn from nature by Mr. Wm. W. Lapham). These materials, having been transmitted to England, were placed at the disposal of Dr. Lindley, who thought he recognized in them a new genus of *Coniferæ*, on which he conferred, in commemoration of the Duke of Wellington, and in consideration of the huge size of the tree, the name of *Wellingtonia gigantea*.

It was supposed, at the time, when the first scientific accounts were published in England, that this tree might possibly be identical with a *Taxodium* described by the unfortunate Douglas, in one of his letters to Sir William J. Hooker (Bot. Mag. Comp. ii, p. 150), as imparting to the mountains of California a most gloomy appearance, and attaining the height

of 300 feet. Douglas had transmitted no specimens with his account ; but a barren branchlet of *Pinus* (*Abies*) *bracteata*, Don, was thought by Sir W. J. Hooker to be part of the plant alluded to, and figured by him in the *Icones Plantarum*, t. 379, as *Taxodium sempervirens*. This mistake was afterwards corrected by the author of it himself, but unfortunately not until Endlicher (*Synopsis Coniferarum*, p. 198) had founded a new species of *Sequoia* (*S. gigantea*, Endl.) upon this figure, with which he also coupled Douglas's account. The referring of Hooker's figure to its proper species (viz. *Pinus* (*Abies*) *bracteata*, Don.) left it again doubtful to which plant Douglas's account referred, and justified in a measure the supposition of Dr. Lindley and others, that it might possibly apply to the newly discovered Mammoth-tree ; but this supposition has not been verified. Douglas, in saying, "The great beauty of Californian vegetation is a species of *Taxodium*, which gives the mountains a most peculiar, I was almost going to say awful, appearance—something which plainly tells us we are not in Europe," evidently alludes to rather a common plant, such as the Redwood (*Taxodium*, or now *Sequoia sempervirens*) really is in the mountains of Upper California ; he cannot possibly speak of the Mammoth-tree, as that, if not confined to the grove called after it, is at all events very local. We are, besides, furnished with a historical proof that Douglas's account does not relate to any other plant than the Redwood (*Sequoia sempervirens*, Endl.) Mr. W. Lobb, who avows himself perfectly familiar with the route followed by Douglas, has shown (*Gardeners' Chronicle* for 1854, p. 22,) that that enterprising traveller was not within 120 miles of the Mammoth Grove ; and in the other localities in which the tree has as yet been discovered, it has not been found attaining the height which Douglas records. We may therefore fairly conclude that Douglas did not see the Mammoth-trees, and that until the year 1850 these monsters of the vegetable creation were totally unknown to Europeans.

The generic name of *Wellingtonia* did not meet with approbation in the United States. The Americans would have felt more pleased if George Washington, the father of their great Republic, had been commemorated in the nomenclature ; and they even commenced in their newspapers an agitation against the adoption of the name "*Wellingtonia*," quite ignoring that the savans of their country bow to the same code of scientific laws which govern the conduct of their European brethren, and that no amount of popular clamour could cause the right of priority here at stake to be set aside. When, therefore, Dr. Winslow exhorted his countrymen, in grandiloquent language, to call the Mammoth-tree, if it be a *Taxodium*, *T. Washingtonianum*,—if a new genus, *Washingtonia Californica*,—he simply proclaimed to all the world that he knew nothing whatever of the laws governing systematic botany. The genus *Wellingtonia* would have suffered nothing from this and similar attacks, if otherwise it had enjoyed a firm foundation. Such, however, was not the

case. When more perfect specimens of the tree than were (in 1853) at Dr. Lindley's disposal came to hand, it was found that the Mammoth-tree (*Wellingtonia gigantea*, Lindl.) presented the same generic characters as the Redwood (*Sequoia sempervirens*,) Endl.) and that consequently *Wellingtonia* must henceforward be considered merely as a second species of *Sequoia*. As far as I am aware, there are only three botanists who have maintained, in print, the untenability of the genus *Wellingtonia*—Torrey, Decaisne, and myself. Torrey seems to have been one of the first who received specimens of the tree, and who arrived at the conviction that he had before him a new species of *Sequoia*. But he refrained from publishing it; nor did he, after the institution of *Wellingtonia*, make it generally known; he communicated it, however, to several of his friends, among them Asa Gray; and it was the latter who first stated, in the "American Journal of Science and Arts," (Second Series) Vol. xviii, p. 286, that Torrey had given to the Mammoth-tree the name of *Sequoia gigantea*; and in August, 1855, Dr. Torrey made to the American Association for the Advancement of Science a communication to the same effect. This remark is the more necessary, as Dr. Torrey, in the "Report on the Botany of Whipple's Expedition," (Washington, 1857), p. 84 [140], refers to a paper of his, in "Silliman's Journal," on the subject, which would naturally lead us to expect that the name had there been published by him. But such is not the case, as a careful search of the said journal, and a conversation with Dr. Torrey during my last visit to New York (1857) enable me to state. The first time that the name of *Sequoia gigantea* occurs in Dr. Torrey's own writings is in the Report just quoted, where, after alluding to Dr. Bigelow's Report (not yet received in Europe?) for a full account of the tree, he says:—"We have shown that in this tree, as in many species of *juniperus*, the leaves are dimorphous; we have also proved that there is no generic distinction between the two trees (viz. *S. gigantea*, Torrey, and *S. sempervirens*, Endl.) The male aments of *S. gigantea*, which were not known to Lindley and Hooker, prove to be in all respects like those of *S. sempervirens*." Torrey's views were borne out by Decaisne in a communication to the Botanical Society of France (Bull. de la Soc. Bot. de France, i. p. 72, 1854). Finally, after examining the specimens in the Museum at Kew, and some that had come into my possession, I stated that *Wellingtonia* was a congener of *Sequoia sempervirens* ('Bonplandia,' iii. p. 27, in adnot. Jan. 15, 1855), at the same time changing the name into *Sequoia Wellingtonia*, Seem. The time has now arrived when it must be decided which of the three names (*Wellingtonia gigantea*, *Sequoia Wellingtonia*, or *Sequoia gigantea*) is to be adopted. After every doubt respecting the generic identity of the Redwood and the Mammoth-tree has been dispelled, there cannot be two opinions about the retention of the name *Wellingtonia gigantea*; it must be given up, and one of the others take its place. My reasons for rejecting the specific name "*gigantea*" were to avoid

a possible confusion with that strange compound, the *Sequoia gigantea* of Endlicher, which belongs as a synonym, partly to *S. sempervirens*, Endl. partly to *Pinus (Abies) bracteata*, Don. Torrey not taking this danger into consideration, retained Lindley's specific name, which, under any other circumstances, would have been the only true course to follow. I am fully aware that, by putting *S. gigantea* Torrey (nec Endl.!), and *S. gigantea* Endl. (nec Torrey!), that danger may be guarded against, as is done in numerous instances, and that my name would have no chance of being adopted on that account alone. But it has, besides, the recommendation of enjoying the right of priority; for, as I have stated, although Dr. Torrey was undoubtedly the first who determined the true systematic position of the tree under consideration, he did not publish his name until 1857, whilst mine was published in January, 1855. The synonymy of the Mammoth-tree and its ally, the Redwood, will therefore stand as follows:—

Sequoia, Endl. Synop. Conifer. P. 197 (1847); Gen. Plant. Suppl. iv. pars. ii. P. 7. n. 1808 (1847). *Condyllocarpus*, Salisb. MSS. *Taxodii* Sp., Lamb. 1. *Sequoia Wellingtonia*, Seem.* Bonpl. iii. p. 27, in adnot. (1855).

Wellingtonia gigantea, Lindl. in Gard. Chronicle for 1853, p. 823 (1853); Hook. Bot. Mag. t. 4777, 4778 (1854); Van Houtte, Flor. des Ser. ix. p. 93, t. 892, 893, &c. p. 121, t. 903 (1853-54).

Washingtonia Californica, Winslow in Californian Farmer for 1854; Hooker's Journal of Bot. and Kew Misc. vii. p. 29 (1855).

Taxodium Washingtonianum, Winslow, *Ibid.*; Hooker's Journ. *l.c.* (1855).

Sequoia gigantea, Torrey (nec Endl.!) in Rep. On Bot. of Whipple's Expedition, p. 84 [140] (1857).

* The entire literature of the Mammoth tree is already very voluminous, and, as far as it is known to me, may be here subjoined:—

American Journal of Science and Arts (Second Series), xvii. p. 440; xviii. pp. 150, 286, xx. p. 281; xxiv. p. 440.

Bonplandia, ii. p. 238; iii. p. 27; vi. 343.

Botanical Magazine, t. 4777, 4778.

Bulletin de la Soc. Bot. de France, i. p. 72 (1854).

Flore des Serres et des Jardins, ix. p. 93, t. 892, 893, p. 121, t. 903.

Gardener's Chronicle and Agricultural Gazette for 1853, pp. 819, 823; for 1854, pp. 22 40 118, 134, 373; for 1855, pp. 7, 69, 83, 838; for 1856, pp. 260, 502, 518, 534, 567, 580, 631 642, 694, 726, 742, 774, 790, 805; for 1857, pp. 517, 534, 550, 678, 629, 643; for 1858, pp. 671 686, 702, 717, 733, 814.

Hamberger Garten-und Blumenzeitung, x. pp. 61, 139, 239, 423, 429; xi. p. 120; xii. pp. 35, 489; xiii. pp. 93, 158; xv. p. xv. p. 12.

Hooker's Journal of Botany, and Kew Garden Miscellany, vii. pp. 106, 150, by George L. Trask, 4to. 4 pp. (Two pamphlets issued to the visitors when the bark of the tree was exhibited in the Philharmonic Rooms, Newman Street, Oxford Street, and Adelaide Gallery, Strand, London, and containing numerous extracts from the New York and London newspapers in reference to the tree.)

Report on the Botany of Whipple's Expedition, by John Torrey, p. 84 [140] Washington, 1857.

Nomina vernacula : "*Mammoth-tree*," "*Big tree*," "*Wellingtonia*."

2. *Sequoia sempervirens*, Endl. Synop. Conifer. p. 199 (1847).

Taxodium sempervirens, Lamb. Fin. ii, t. 64.

Taxodium Nutkaense, Lamb. Herb.

Taxodium, sp., Dougl. in Bot. Mag. Comp ii. p. 150 (1836).

Sequoia gigantea, Endl. (nec Torrey!) Synop. Conifer. p. 198 (1847).

Nomen vernaculum : "*Redwood*."

The Mammoth-tree is rather local in its geographical range. True. Carrière states that an officer of the French navy brought cones identical with those obtained in California from a latitude about 10 degrees north of the locality in which it was first discovered ; but as no difference between the cones of *Sequoia sempervirens* (a common tree in that latitude) and *S. Wellingtonia* has as yet been pointed out, the evidence adduced cannot be looked upon as conclusive. More probable seems the statement that *Sequoia Wellingtonia* has been met with in Carson Creek, a few miles northward of the Mammoth-tree Grove, and that of its having been observed in various other parts of the Sierra Nevada, where, however, according to the unanimous testimony of the various accounts, it does not attain those gigantic dimensions we are wont to associate with it. It is beheld in the greatest perfection in the Mammoth-tree Grove situated near the head-waters of the Stanislaus and San Antonio rivers, in the county of Calaveras, latitude 38° N., longitude 120° 10' W, at an elevation of between 4000 and 5000 feet above the sea, and about fifteen miles from Murphy's Camp, the nearest gold-diggings, ninety-five from Sacramento city, and eighty-five from Stockton (by stage route). In visiting the place, the traveller can obtain vehicles and animals at Murphy's Camp, and proceed to his destination by carriage-road, gradually ascending, through a splendid forest of pines, cedars, and firs, here and there dotted with fine oaks. The valley in which the grove is situated contains about 160 acres of land, and, according to Winslow, is a basin of coarse siliceous material surrounded by a ridge of syenitic rock, which in some places projects above the surface. The soil is a rich and very deep-black loam. The climate is delightful. During the summer it is entirely free from the scorching heat of the lower country, the vegetation remaining fresh and green, while the water is as pure as crystal, and almost as cold as ice. The vicinity, we are assured, offers every inducement to sportsmen, many kinds of game abounding, while the brooks teem with excellent trout. Delightful horse-back rides conduct the visitor to the Falls of San Antonio, the basaltic cliffs on the North Fork of the Stanislaus, and other interesting points of scenery and objects of curiosity.

Things are easiest judged of by comparison ; and what proclaims loudly the enormous size of our vegetable giant is its growing in a country as distinguished for huge trees as Kentucky and Virginia are for tall men. Bate-man has attempted more special comparisons, strikingly illustrated in a

series of diagrams which he exhibited in a lecture on the subject at Conington, and afterwards in the rooms of the Horticultural Society of London. One of these diagrams (on the scale of 1 foot to 10 yards) represented a Mammoth-tree 300 feet high, and a ladder of a common length, with a man half-way upon it, leaning against the trunk : by comparison the ladder assumed the appearance of a walking-stick, the man that of a beetle. More fully to illustrate these extraordinary dimensions, sketches had been drawn of some of the tallest buildings in the world,—the Pyramids of Egypt, St Peter's at Rome, Salisbury Cathedral, and St. Paul's in London,—showing that the Mammoth-tree contested the palm with St. Peter's, and was but a small distance below the Pyramids. In a comparison with other trees, the Californian giant came off equally victorious; the highest palm dwindled down to the appearance of sugar-cane, the spruce to that of Juniper, and even the far-famed Cedar of Lebanon to that of a mere bush. A quotation of the absolute height of the *Sequoia Wellingtonia* is equally calculated to impress us with amazement. Most of the specimens now standing at the Mammoth Grove attain the average height of 300 feet ; but one of them—known as the “Mother of the Forest,” and stripped of its bark to the height of 116 feet, for the purpose of being publicly exhibited—actually measures 327 feet in height, and 90 feet in circumference ; or if we are disposed to credit the statement put forward by the exhibitor of the bark in New York and London, its full height is 363 feet, diameter at base 31 feet, and diameter 100 feet from the base, 15 feet. Enormous as these dimensions may be, they are as it were put in the shade by remembering what those of another tree must have been when in full vigour. This “Father of the Forest,” as the specimen has been appropriately termed, measuring 112 feet in circumference at the base, can be traced 300 feet, where the trunk was broken by falling against another tree : it here measures 18 feet in diameter ; and, according to the average taper of the other trees, this giant must have been about 450 feet, and was no doubt one of the highest vegetable forms of the present creation.

Other Coniferæ often attain an enormous size, as for instance the Red-wood (300 feet), or the *Pinus Lambertiana*, Dougl. (150, 200 feet, and more) ; and some of the Gum-trees of Van Diemen's Land are 215 feet high ; but they are all topped by a fully developed Mammoth-tree. The mind involuntarily asks how many years were requisite to pile up such mountains of vegetable cells, and begins to speculate on the possible age of such monsters. When the Mammoth-tree first came into notice, it was assumed to be 3000 years' old ; or, in the editorial language of the ‘Gardeners' Chronicle,’ “it must have been a little plant when Samson was slaying the Philistines or Paris running away with Helen, or Æneas carrying off good Pater Anchises upon his filial shoulders.” Subsequent investigations, however, have proved his assumption to be erroneous. The *Sequoia* under consideration is evidently

a fast-growing species, performing, according to the careful observations made by J. Reed of Peterborough, its growth between 6 P. M. and 6 A. M., and retarding and increasing in proportion to the warmth of the night. Plants raised from the seeds brought to England towards the end of 1853, had already in 1857 attained 6 feet in height, thus having grown in every year about $1\frac{1}{4}$ foot; so that if they continue growing at the same rate, it would require two hundred years to produce a tree 300 feet high. But it is a well-known fact that the growth does not proceed at such a uniform rate; and no process except that of counting the annual layers of the trunk can be applied for the purpose of computing the age of these trees. Asa Gray, in a paper on the age attained by the largest known trees, has attempted to do this; unfortunately, the section of the trunk exhibited at Philadelphia, and supplying him with the principal data, was not that of the *Sequoia Wellingtonia*, as he at the time believed, but that of the *Sequoia sempervirens**; and it is probably owing to this mistake that the scientific public

* By carefully bearing in mind that the trunk exhibited at Philadelphia was that of *Sequoia sempervirens*, and not that of *S. Wellingtonia*, Gray's article, weeded of all matter arising from the confusion of the two species, may still be made to bear indirectly upon the questionable age of the Mammoth-tree. This I have attempted to do in the following. Gray says:—"The size of this tree is such as to give it a presumptive claim to rank amongst the oldest of the present inhabitants of the earth, its length being (on the authority of the proprietor of the section) 322 feet. . . . This section was taken at the height of 25 feet from the ground, and, according to the measurement of my friend Thomas P. James, Esq., of Philadelphia, it is about $12\frac{1}{2}$ feet in diameter, including the bark. Mr. James, at my request, has taken a careful measurement of the wood itself, excluding the bark. The three diameters taken by him respectively measure 9 feet 6 inches, 10 feet 4 inches, and 10 feet $10\frac{1}{2}$ inches; the average diameter of the trunk, at the height of 25 feet from the ground, is a little over 10 feet 3 inches. . . . The section of the trunk at Philadelphia has been hollowed out by fire and other means to a shell of 3 or $4\frac{1}{2}$ inches in thickness. Of this I have, through the kindness of the proprietor and of Mr. James, a piece of the wood, including nearly 3 inches of this section. What is now wanted, and what, unfortunately, I do not possess, is a foot or two of the wood from the central parts of the tree,—a desideratum which may doubtless be supplied hereafter. The data at hand, however, will suffice for determining an age which the tree cannot exceed, unless it be supposed to have grown more slowly during the earlier 9/10ths of existence than during its later years, which is directly contrary to the ascertained fact in respect to trees in general. Now, the piece of wood in my hands exhibits an average of forty-eight layers in an inch. The semi-diameter of the trunk at the place where it was taken is about 5 feet 2 inches. If the tree increased in diameter at the same rate throughout, there would have been 2976 annual layers, which, allowing twenty-four years for the tree to have attained the height of 25 feet, would give it an age of 3000 years from the seed. This corresponds so closely with Dr. Lindley's estimate [of *Sequoia Wellingtonia*!], that we may suppose him to have employed equivalent data in a similar manner. How great a deduction must we make from this estimate, in consideration of the greater thickness of the layers on a younger tree? The only direct data I possess bearing on this point are derived from a piece of a transverse section, $\frac{1}{2}$ inches deep, of a 'rail,' which the exhibitor says was taken from the trunk at the height of 275 feet from the ground. As its layers, on a breadth of nearly $\frac{3}{4}$ ths of an inch, show only a slight curvature, it must have come from a part of the trunk still

still fancy the age of 3000 years, originally allotted to the tree in question by vague computation, may still be considered as correct,—quite overlooking that Dr. Torrey, counting the layers on a complete radius of another trunk, about the genuineness of which there was no doubt, has furnished the following data :—

“The 1st hundred layers occupy a breadth of $17\frac{1}{2}$ inches.

2nd	”	”	”	14	”
3rd	”	”	”	$12\frac{1}{2}$	”
4th	”	”	”	13	”
5th	”	”	”	$16\frac{1}{2}$	”
6th	”	”	”	$8\frac{3}{4}$	”
7th	”	”	”	$7\frac{3}{4}$	”
8th	”	”	”	11	”
9th	”	”	”	10	”
10th	”	”	”	11	”
11th	”	”	”	$11\frac{1}{2}$	”

several feet in diameter. On this section, the exterior inch nearly all alburnum, contains 90 layers, the next 60, the next 45, the remaining half-inch 16, making 32 to the inch. That the exterior layers should be thinner at this height than more near the base of the tree, is just what would be expected. If we apply this ratio of decrease of the number of layers to the inch as we proceed inwards to the section of 25 feet from the ground, we should, at 4 inches within that part of the circumference which I have examined, have only seventeen layers to the inch, which, taken as the average thickness, would make the tree only $1034 + 24 = 1058$ years old. But it is not probable that the thickness of the layers increases so rapidly. The data we possess on other trees go to show that a tree, after it is 400 or 500 years old, increases in diameter at a pretty uniform rate for each twenty additional years, on the whole, although the difference of the thickness of any two or more contiguous layers, or the same layer in different parts of the circumference, is often very great. Still, when we consider how very much thicker are the annual layers of a vigorous young tree than of an old one, perhaps we should not be warranted in assuming more than the average of seventeen layers to the inch for the whole section. Some useful data may be obtained from a tree more nearly related than any other to those of California, though of a different genus, namely the so-called Cypress of our Southern States (*Taxodium distichum*, Rich). I possess three sections of different trees of *Taxodium*, reaching from the centre to the circumference. One of these, on an average radius of 27 inches, exhibits 670 layers; a second, on a radius of 30 inches, has 525; a third, on a radius of 22 inches, has 534 layers. The average is 576 layers to a semi-diameter of 26 inches, or about 22 layers to an inch. Half of this growth (13 inches radius) was attained at the close of the first century, while the exterior layers of the oldest specimen were only the 15th or 16th of an inch in thickness.... We may safely infer, I think, in the absence of other data, that when the tree in question had attained the size of 26 inches in semi-diameter, it was only 576 years old. If, therefore, we suppose it to have increased at the intermediate ratio of thirty-five layers per inch for the next 26 inches, and at the actual rate of the last century (as ascertained by inspection), namely at forty-eight layers per inch for the remaining 10 inches, we should assign to it the age of 2066 years as its highest probable age. I think it more likely to be shown, when the wanting data are supplied, that the tree does not antedate the Christian era.”—Asa Gray, in *American Journal of Arts and Science*. Second series, Vol. xvii. p. 440 (1854).

The remainder of 20 layers occupies over 1 inch : 1120 layers on the semi-diameter of 135 inches, or 11 feet 3 inches. We have ventured to reduce by more than one-third the accredited statement or estimate that this tree was 3000 years old. The facts show that the tree lacks almost three centuries of being half as old as it was said to be ! Its enormous size is owing to its continued rapid growth rather than to any extraordinary age. The Mammoth-tree, therefore, so far from having been a contemporary of the unhistorical personages whom Homer's immortal songs have made famous, has sprung up in quite a historical epoch—a few centuries after the commencement of the Christian era ; and, moreover, its still considerable age is equalled, if not surpassed, by its congener the Redwood (*Sequoia sempervirens*, Endl.).

The tenacity of life keeps equal pace with the vitality of the tree. One of the specimens in the Mammoth Grove has been stripped of its bark to a height of 116 feet, but, we are assured, without being in the east affected in its growth ; and most of the other specimens there have, in consequence of the fires raging through the forest, or perhaps the fires kindled by the Indians, burnt cavities, a few of which are sufficiently large to admit a person on horseback to enter, and they are moreover 40 feet deep ; but the trees do not seem to have suffered particularly from this. In some of the dead, fallen-down trunks, cavities 200 feet long [caused by age ?] can be traced. The large tree, felled by speculators, put forth several young shoots after it had been felled for some time (Conif. Bonpl. ii. p. 238). Such an almost willow-like tenacity of life is met with in but a few *Coniferae*, and may with justice be counted among the most prominent peculiarities of the *Wellingtonia*.

The wonderful invention and discoveries of our age have in more than one instance outstripped all limits of poetic fancy. By means of the electric telegraph, we have outdone Puck's startling promise to

“ put a girdle round about the earth

In forty minutes ;”

and our Californian giant more than rivals the tree placed by Milton in the hands of Satan as a lance,

“ to equal which,

The tallest pine hewn on Norwegian shores,

To be the mast of some great amiral,

Were but a wand.”

But this very fact, the realization of much that was thought ideal, has engendered and nursed a desire to behold with our own eyes whatever belongs to this category. There probably never was a time in history when “ sight-seeing ” was regarded with more favour, or found readier advocates, than the present. Speculators were therefore not backward in making capital out of this state of feeling as applied to the Mammoth-tree. To transport masses

of people to the grove was impossible ; but to transport at least portions of the famous giants to the centres of our great cities, practicable. The latter accordingly, was done ; and the earliest accounts of the Mammoth-tree, which reached Europe were coupled with the sad intelligence that a piece of Vandalism had been perpetrated in Upper California, unexpected in our enlightened days. One of the finest trees of the grove, we were informed, had been felled for the purpose of being publicly exhibited. This individual, was 96 feet in circumference at the base, and solid timber. The work of destruction commenced by boring with augers and sawing the spaces between,—a labour engaging twenty-five men for five days. But when this was done, the tree was found to stand so nearly perpendicular that it would not fall ; and it was only by applying a wedge and battering-ram, during a strong breeze, that the trunk was finally upset. In falling, it convulsed the earth, and by its weight forced the soil from beneath it, so that it lies in a trench ; and mud and stones were hurled near a hundred feet high, where they left their mark on neighbouring trees. The hole forms the bed for two bowling-alloys. A section of 2 feet long taken from the stump, also a portion of bark, were both exhibited. The latter was put up in a natural form, and constituted a spacious carpeted room, containing a pianoforte, with seats for forty persons. On one occasion 140 children were admitted without inconvenience. The surface of the stump, still remaining in the ground, is smooth, and affords ample space for thirty-two persons to dance, it being 75 feet in circumference ; theatrical performances have also been given upon it on various occasions. It is covered by a rustic arbour, and connected by a floor with the Mammoth-tree Hotel, founded by Mr. Lapham, to whom we are indebted for much valuable information respecting the plant under consideration. The success with which the public exhibitions of these specimens in San Francisco, New York, and Paris had been attended, induced, in 1854 another speculator to strip a second magnificent tree, called the “Mother of the Forest,” up to a height of 116 feet, of its bark, fortunately without affecting by this ruthless process the vitality of the tree. It required the labour of five men ninety days. During this time a person had a fall of 100 feet from the scaffolding, and, curiously enough, escaped with a broken limb. The bark was removed in sections 8 feet in length, and each piece marked and numbered, so that it could be put up in precisely the same position that it occupied on the tree. It was then, after being carted eighty miles overland, shipped down the river to San Francisco, and thence on a clipper vessel around Cape Horn to New York, where, after being exhibited for a season in the Crystal Palace, it was transmitted to London, and was for the first time on view, April, 1856, in the Philharmonic Rooms, 14, Newman Street, Oxford Street, and afterwards at the Adelaide Gallery, Strand. But both of these localities were too low to admit of the whole section of the stripped

bark being put up ; nor, indeed, was there any other available building in the British metropolis could serve the purpose. Fortunately the Crystal Palace at Sydenham possessed the necessary height ; and ever since the autumn of 1856 the whole of the bark, to the height of 116 feet, has there been exhibited. The interior is fitted up with a table, chair, and other furniture, and forms a large and spacious drawing-room. Daguerreotypes and photographs of the tree and grove can also be seen, together with living specimens of the species ; and if this exhibition on the one hand fills us with regret at the Vandalism of mercenary men, it on the other brings home to us the prodigious power of American vegetation.

It was at one time feared that not many years would elapse before the last vestige of the Mammoth-trees would be destroyed. It was the 'New York Herald' which, on the 17th of December, 1854, first pleaded for their protection. "We say," argued the 'Herald,' "that Congress should interpose, upon the presumption that these trees are public property, are on the public lands of California, and because Congress has already interposed to protect the public Live-Oak (*Quercus virens*) forests of Florida from the rapacity of unscrupulous speculators..... We repeat that it is the duty of the State of California, of Congress, and of all good citizens, to protect and preserve these Californian monuments of the capabilities of our American soil." In Europe, the danger in which the trees were placed was viewed with equal apprehension, inducing a correspondent of the 'Gardeners' Chronicle' to suggest that a petition of the scientific men might be sent to the American Government, praying for the protection of this eighth wonder of the world. Fortunately the authorities were fully alive to their duty, by prohibiting the removal of any tree under any circumstances whatever, and thus, by throwing the sanctity of the law around the hallowed grove, preserved to North America an object quite equal in grandeur to the famed Falls of Niagara, the Mammoth Cave of Kentucky, or the Natural Bridge of Virginia."

The number of large specimens still standing in the Mammoth-tree Grove amounts to ninety-two, nearly all of which have received from the people some appropriate and romantic name. A few of the most prominent it may not be uninteresting to describe. After leaving the hotel, and proceeding into the forest by the upper trail, we are at once struck with the magnitude of the trees, and passing several immense specimens, we reach the "Miner's Cabin," measuring 80 feet in circumference, and attaining 300 feet in height. The "cabin," or burnt cavity, measures 17 feet across its entrance, and extends upwards of 40 feet. Continuing our ramble, admiring the luxuriant growth of underwood, consisting of firs, cedars, dog-wood, and hazel, we come to the "Three Graces." These splendid trees appear to grow, and perhaps do grow, from one root, and form the most beautiful group in the forest, towering side by side to the height of 290 feet, tapering symmetrically from their base upwards ; their united circumference amounts to 92 feet ;

it is 200 feet to the first limb on the middle tree. The "Pioneer's Cabin" next arrests our attention, rising to the height of 150 feet (the top having been broken off), and 33 feet in diameter. Continuing our walk, we come to a forlorn-looking individual, having many rents in the bark, and withal the most shabby-looking in the forest: this is the "Old Bachelor;" it is about 300 feet high and 60 feet in circumference. The next tree is the "Mother of the Forest," already mentioned as having been stripped of its bark by speculators in 1854. We are now amidst the "Family Group," and standing near the uprooted base of the "Father of the Forest." This scene is grand and beautiful beyond description. The venerable "Father" has long since bowed his head in the dust; yet how stupendous even in his ruins! He measures 112 feet in circumference at the base, and can be traced 300 feet, where the trunk was broken by falling against another tree. A hollow chamber or burnt cavity extends through the trunk 200 feet, large enough for a person to ride through. Near its base is a spring of water. Walking upon the trunk, and looking from its uprooted base, the mind can scarcely conceive its prodigious dimensions, while on either hand tower his giant sons and daughters. Passing onward, we meet with the "Husband and Wife," leaning affectionately towards one another; they are each 60 feet in circumference, and 250 feet in height. "Hercules," one of the most gigantic specimens in the forest, stands leaning in our path. This tree, like many others, has been burnt at the base; it is 325 feet high, and 97 feet in circumference. The "Hermit," rising solitary and alone, is next observed. This tree, straight and well-proportioned, measures 320 feet high and 60 feet in circumference. Still returning towards the hotel by the lower trail, we pass the "Mother and Son," which together measure 93 feet in circumference; the "Mother" is 320, the "Son" a hopeful youth of 300 feet. The "Siamese Twins and their Guardian" form the next group: the "Twins" have one trunk at the base, separating at the height of 40 feet, each measuring 300 feet high; the "Guardian" is 80 feet in circumference, and 325 feet high. Beyond stands the "Old Maid," slightly bowing in her lonely grief; she measures 60 feet in circumference, and is 260 feet high. Two beautiful trees, called "Addie and Mary," are next to arrest our attention, measuring each 65 feet in circumference, and nearly 300 feet high. We next reach the "Horseback Ride," an old fallen trunk of 150 feet in length, hollowed out by the fires which have, in days gone by, raged through the forest. The cavity is 12 feet in the clear in the narrowest place; and a person can ride through on horseback a distance of 75 feet. "Uncle Tom's Cabin" next claims our admiration, being 300 feet high and 75 feet in circumference. The "Cabin" has a burnt entrance of 2½ feet in diameter; inside, the cavity is large enough to seat fifteen persons. Two other trees we must note; one of which, named the "Pride of the Forest*," remarkable for

* In some accounts, "Bride of the Forest." I hold "Pride" to be correct.—B. S.

the smoothness of its bark, measures 280 feet in height and 60 feet in circumference. The "Burnt Cave" is also remarkable; it measures 40 feet 9 inches across its roots, while the cavity extends to the distance of 40 feet,—large enough for a horseman to ride in, and turning round, return. We now reach the "Beauty of the Forest," a tree 65 feet in circumference, fully 300 feet high, symmetrical in form, and adorned with a magnificent crest of foliage. Reaching the road, and returning to the house, we pass the "Two Guardsmen," which tower to the height of 300 feet, and are 65 and 70 feet in circumference, forming an appropriate gateway to this wonderful forest.

The trunk of the Mammoth-tree is very straight, and covered with a bark much resembling that of the Redwood in appearance; it is of a rich cinnamon-brown, and from 18 to 22 inches thick! The wood, when first cut, is white; but it soon becomes reddish, and long exposure makes it as dark as mahogany; it is soft, yet nevertheless of slow decay, and abounds in the red colouring matter soluble in water, from which the Redwood takes its name. The branchlets are round, somewhat pendant, and resemble those of a Cypress or a Juniper. As is the case in a more or less marked manner in most *Coniferae*, not excepting even *Sequoia sempervirens*, there are two kinds of foliage, the same branch often presenting both imbricated and distichous leaves. The leaves are alternate, perennial, in the younger plants oblong-subulate, apiculate or mucronate, semiamplexicaul, keeled at the back, plane within, but with a slightly elevated central ridge; in the older plants they are smaller, shorter, more compact and crowded, ovate-lanceolate, acute. Both male and female flowers present the same structure as those of *S. sempervirens*; the same may be said of the cones; the only difference in the latter being that those of *S. Wellingtonia* are generally a little larger than those of its congener.

The Mammoth-tree was introduced into European gardens by Mr. William Lobb; and in 1853 single plants were sold by Veitch's Nursery for £2 2s.; but since then quantities of seeds have been imported, and there is now hardly a horticultural establishment without one or more representatives of this remarkable evergreen. In England it seems to stand the winter without injury; and even in Germany and other parts of Northern Europe it does not require the protection of a glass-house; so that even in those countries it may become a forest and useful timber-tree. In July, 1856, complaints were heard that, in spite of the most careful culture, a peculiar disease had befallen this new *Sequoia*, in consequence of which the twigs were observed to die off in the same manner as they do in *Crytomeria Japonica*. Horticulturists began to take alarm, and feared that their new acquisition would inevitably be lost; but Dr. Lindley soon discovered that, though the twigs died, the main stem and branches continued to grow vigorously, and that the so-called disease was constitutional, and could not be

looked upon as a sign of ill health, or proof of bad culture. In 1858 it bore ripe fruit in England, under the skilful treatment of Mr. J. Buckle, at Theford. May the Mammoth-tree continue to flourish, and display in the gardens and pleasure-grounds of Europe the same gigantic proportions that render it an object of wonder and amazement in its native valleys of America!--*The Annals and Magazine of Natural History*, March, 1859.

(Friday, the 10th December 1858.)

Baboo Pearychand Mittra, Vice-President, in the chair.

The minutes of the last general and special meeting were read and confirmed.

The gentlemen, proposed at the last meeting, were duly elected members, *viz.* :—

Messrs. Alexander Ross, B. C. S. ; J. W. Maseyk ; P. Augier ; M. W. Townsend ; A. Maclean, B. C. S. ; E. A. Dow ; F. Reid ; C. Connaw ; T. J. Knox, M. C. S. ; G. B. Tayler ; E. H. O'Brien ; Captain H. Raban ; the Secretary for the time being, Artillery, Head Quarter Mess ; and Baboo Sonatun Bysack.

The names of the following gentlemen were submitted as candidates for election :—

C. W. Reade, Esq., Madras Civil Service, Vizagapatam,—proposed by Captain W. G. Owen, seconded by the Secretary.

Dr. R. H. Perkins, Civil Surgeon and Assistant Salt Agent, Hidgelee,—proposed by Mr. Henry Cowie, seconded by Mr. W. G. Rose. • •

Roy Prasunonarain Deb Bahadoor, Dewan of His Highness the Nawab of Moorshedabad,—proposed by Rajah Ranchand Sing, seconded by Baboo Ramanauth Tagore.

James Rowe, Esq., Merchant, Calcutta,—proposed by Mr. Pat. Johnson, seconded by Mr. Wm. Stalkartt.

R. S. Limond, Esq., Toolseah Factory, Bhaugulpore,—proposed by Mr. W. Landale, seconded by Mr. Thomas Grant.

J. Gow Smith, Esq., Rutenpore Factory, Kishnaghur,—proposed by Mr. J. Forlong, seconded by Mr. F. MacLagan.

Robert Newcomen, Esq., Connanuggur Factory, Kishnaghur,—proposed by Mr. J. Forlong, seconded by Mr. F. MacLagan.

A. Brousmichie, Esq., Hurra Factory, Kishnaghur,—proposed by Mr. J. Forlong, seconded by Mr. F. MacLagan.

John Wienholt, Esq., Merchant, Calcutta,—proposed by Mr. H. Knowles, seconded by Mr. W. Stalkartt.

Captain F. F. Vincent, 30th Regiment N. I.,—proposed by Mr. F. Schiller, seconded by the Secretary.

The following contributions were announced :—

1. Selections from the Records of the Government of Madras, No. 45. Report on the Agricultural Exhibitions in the Provinces in 1857. Presented by the Government of Bengal.

2. Report of the Conservator of Forests in the Madras Presidency ; and a Manual of Accounts of the Forest Department. Presented by Dr. H. Cleghorn.

3. Journal of the Asiatic Society of Bengal, No. 3, 1858. Presented by the Society.
4. Selections from the Bethune Society's Papers, No. 5. Presented by the Society.
5. Seed of a species of *Momordica* from Upper Assam. Presented by Captain W. H. Lowther.
6. A collection of Orchids from the Andamans. Presented by Dr. J. P. Walker, Superintendent of Port Blair.

Nursery Garden.

The Officiating Gardener's monthly report was read, of which the following are extracts :—

“ The seeds of ‘ Kamptie Mahi,’ known in Assam as a species of wild dhol, presented by Mr. Grose in May last, were sown in due course in open ground in the kitchen garden, where they freely germinated, and have now yielded a small but good crop : the plant appears to belong to the *Mucuna* tribe, and, I believe, is known as the ‘ Negro bean.’

“ The seeds of New Orleans cotton, received in October last, from the Manchester Cotton Supply Association, have germinated very favorably. I had sown 100 seeds in three gunlows ; out of the whole, 56 seeds freely germinated, which, therefore, have yielded an average per-centage of 60. Seeing such a good result, I have laid down some seeds in open ground, in two lines, near the cocoanut plantation adjoining the Pernambuco cotton plants raised from seeds presented by the Government of India during the present year.

“ All the vegetable seeds received from England, America, and Cape of Good Hope, are laid down in open ground in the kitchen garden, and the whole have readily germinated, yielding a result equally satisfactory as when reported of their trial sowing, excepting the seeds from Messrs. Gibbs and Co. of London, which I indeed exceedingly regret to say have failed most signally.

“ The Cape peas have been equally as good as the past year, and have most readily germinated, and are now thriving well. The American peas have much redeemed their character in comparison with the last year's result, but the ‘ black-eyed marrowfat’ is unexceptionably good. The ‘ tall sugar’ and ‘ Prussian pea’ take next rank, but the ‘ tall knight marrowfat,’ though not a decided failure, still may be considered unsatisfactory. As to the different kinds of beans, all have proved very creditable, as all have freely germinated. ”

“ As the *Dioscorea batatas* or ‘ Chinese yam,’ received from Mr. Fortune of China, and the ‘ New Zealand yam,’ will soon be in a fit state to be dug

up, and as a good portion may be distributed to members with advantage, it would be necessary, owing to a limited supply of the crop of both, that such members requiring the above yams should have their names registered in order to make an equal distribution of them.

* In the orchard, besides the general stock of all kinds of fruit grafts, are now ready a few of the Mauritius mango grafts, layers of good kind of pomegranates, all kinds of limes and lemons, and guavas, a few seedlings of best kind of papias, cocoanuts of fine healthy kinds, between two and three years old ; and a few of the *Callisaccion longifolium*, which is said to yield a very luscious fruit, equal to the litchee ; and a few varieties of palms.

“ In the flower garden, besides the general collection of all kinds of ornamental trees, shrubs, and climbers, a few *Thuja* *sps.* and *Cupressus funebris* raised from seeds received from Mr. Fortune from China in 1856, a few layers of *Amherstia*, some fine specimens of chrysanthemums, a few cuttings of *Araucarias*, are still available to members requiring them ; as also a small number of seedlings of different kinds of annual flowers raised from Gatter’s present year’s importation ; and also a few seedlings of all kinds of cabbages and celery.

“ The grains of *Holcus sorghum*, raised from those presented by General Sir John Hearsay, in March last, will be fully ripe within a few days, when they shall be reaped and forwarded for distribution to members requiring them ; as also a small collection of bearded paddy, raised from seed presented by Captain Ripley about May last. The grains of *Holcus sorghum* yield a very fine flour, of sweet taste, and make a most wholesome bread, and is always eaten as baked hand-bread.

“ In conclusion, I beg to add, that the stump of the *Bambusa gigantea*, now forwarded, is from the specimens of a clump which fell from the effect of the storm of 25th October last : it was reared from cuttings raised from the bamboo received, I suppose, from the late Dr. Wallich in 1813, when Superintendent of the Botanical Garden. This bamboo measured 45 feet in length and 22 inches in width ; the shoot sprung up in July last in its usual season, and within the short space of four months it had not only attained that width, but that extraordinary height.”

Mr. Manuel also acknowledges a contribution, from the Rev. Mr. Firmininger, of a number of *Ranunculus* and *Oxalis* bulbs, imported by the October mail ; and a collection of flower seeds from Captain H. B. Weston, at present in England, which have germinated very readily.

Establishment of a Branch Agri-Horticultural Society at Balasore.

The Secretary read the following communication, dated 4th December (and enclosures), very recently received from Baboo Gourdooss Hysack, announcing

the gratifying fact of the formation of a Branch Society at Balasore, of which he had been appointed Secretary :—

“ I have the honor to communicate, for the information of the Agricultural Society in Calcutta, the proposed establishment of a Branch Society of Agriculture and Horticulture in the district of Balasore.

“ *2nd.*—The address of Baboo Puddolochun Mundul, and the proceedings of a meeting of the inhabitants and residents of the station, held on the 22nd ultimo, herewith submitted, contain an account of the origin and the principles on which the proposed Branch Society is to be conducted.

“ *3rd.*—The list of subscribers given below will show the annual fund just now available, which amount [Rs. 657] it is proposed for the present to apply to procuring from Calcutta, with the aid of your Society, fresh supplies

of useful seeds and plants for gratuitous distribution, under certain conditions, among the farmers cultivating any of the products noted in

Cotton, sugar-cane, potatoes, hemp, flax, and tobacco. the margin, and the services of professional *mulees*, upon adequate salaries, to direct and superintend the cultivation and growth of the different products.

“ *4th.*—The Code of Bye-laws, previous to its adoption by the Branch Society, is transmitted for submission to, and approval of, your Society, with a request that you will be pleased to send for our instruction and guidance a copy of the Rules that are laid down for the observance of Branch Associations.

“ *5th.*—I am desired also to request that you will be good enough to move your Society to state the nature and extent of the aid and co-operation which they are willing to afford to their Branch institution at Balasore.

“ *6th.*—It is needless to state what our members feel—that the kind co-operation and encouragement of the Parent Society will be the fundamental elements in the success and prosperity of this little sapling.

“ I have, &c.,

“ GOURDOSS BYSACK,

“ *Secretary, Balasore Branch Agricultural Society.*”

Translation of an Address read by Baboo Puddolochun Mundul, on the 1st November 1858.

“It is an auspicious day to us. Her Majesty the Queen of England has assumed the sovereignty of our country. We hail the occasion with feelings of sincere joy and gratitude. We shall cheerfully illuminate our family dwellings this evening, but while we thus rejoice, we cannot but feel the poverty of our demonstration. We are celebrating in a very poor and ephemeral way the advent of a new and happy era in India. We ought to

commemorate the day in a marked and durable manner, and, I think, nothing will be more acceptable to Her Majesty, and more useful to her loyal and devoted subjects in this district, than the establishment of an Agricultural Society in connection with that of Calcutta. You are aware how much we are dependent upon other districts for the supply of some of the common products and necessities of life.

"Cotton (kapas), potatoes, tobacco, and sugar-cane, which we borrow from other places, are annually consumed in the single district of Balasore to the value of upwards of a lakh and a half. Sugar-cane, hemp, and flax already grow here, but, compared to those of Bengal, they are wretched. The soil is sufficiently fertile, particularly in places adjacent to the river, but our products are scanty and unsuccessful. The fault is entirely our own, for we do not see how the products grow elsewhere, and what preliminaries may be necessary to ensure success to cultivation.

"Good seeds, a little instruction in manuring, &c., and a slight encouragement to the successful farmers, are all that we want. If you will co-operate with us, and spend a little money on the experiment, I dare say you shall, ere long, see us successful, and eventually become independent of other districts. We will not only benefit the people by opening up fresh resources to them, but we shall make ourselves more comfortable and happy.

"I am glad to inform you, that, on a reference having been made to the Agricultural Society in Calcutta, I have been assured by the Secretary, that the Society are quite willing to co-operate with us in any practical suggestions we may make in regard to improvements in this district. If we can obtain good seeds, which may be had almost gratuitously from Calcutta, and well-trained *malees* to instruct and superintend our farmers, I am quite sure that, with judicious management, and by bestowal of little gifts in the shape of prizes, we shall be able to achieve considerable success to make our labor yield handsome returns. When the ryots shall once have seen their way clear, they will of themselves cease to molest us in future for aid or advice."

The above address was read in Bengalee by Baboo Puddolochun Mundul to the assembly that had met to hear the proclamation on the 1st of November last. Mr. Schalch, with all the European and some of the principal native gentlemen present, repaired to the tent, and explained to them the important proposition, brought forward by the Baboo, and the claims it had upon the best co-operation of every one interested in the welfare of the district. Everybody seemed to approve of the movement, and Mr. Schalch, at the request of the Baboo and his friends, agreed to be the President of the new Society. But as Mr. Schalch thought it would be informal to proceed further, lest it should be supposed that the people were invited on the occasion for a different purpose than that of hearing the Proclamation, he adjourned the meeting, with simply adding that the new Society's existence

be dated from that day—being the day on which Her Majesty assumed the Imperial Government of India.

Proceedings.

According to previous announcement, a meeting of the principal inhabitants and residents of Balasore was held in the private residence of the Collector, on the 22nd November last, at 12 o'clock P. M.

The Chairman opened the proceedings by stating that we have met to-day for the purpose of organizing an Agricultural Society in this district. The necessity and object of such an institution have been fully and clearly described by Baboo Puddolochun Mundul in his able address read to you on the day of the Proclamation—a translation of the address will be found on the table. Baboo Puddolochun has shown much public spirit in taking the initiative in this laudable undertaking; and his efforts, I am glad to observe, already prognosticate success, for he has secured, as you will perceive from the subscription book, a considerable fund to enable us to begin operations. We can now proceed to name the Society and elect a Secretary.

Baboo Puddolochun Mundul laid on the table the correspondence that had passed between him and the Secretary to the Agricultural Society in Calcutta, on the subject of forming a Branch Society in Balasore. The Baboo, in his letter dated the 19th September last, mentioned to the Society the desirableness of directing their attention to the improvement of agricultural interests in distant and destitute districts, and requesting instructions as to the best mode of supplying the desideratum in Balasore.

The Secretary, in his reply to the Baboo, under date the 9th October last, communicated a resolution of the Society, in which they expressed their willingness “to co-operate with the Baboo in any practical suggestions he may make in regard to improvements in his district; and proposed that he and the other wealthy and influential zemindars at Balasore form a Branch Society, to co-operate with them for the introduction of useful seeds and plants, and for such other purposes as may be suggested with the view of attaining the desired object.”

Resolved—That, agreeably to the above kind offer of the Calcutta Society, our Society be designated “the Branch Society of Agriculture and Horticulture at Balasore.”

Proposed by Mr. Schalch, and seconded by Dr. Kendall, that Baboo Gour-doss Bysack be the Secretary. Carried *nem con*.

Resolved—That Baboo Puddolochun Mundul and the Secretary form into a Sub-Committee, to prepare and submit to the Society, at the next meeting, a Code of Bye-laws, and plan of operations that may be necessary to adopt for accomplishing the object in view.

Resolved—That a copy of the proceedings be forwarded for the information of the Parent Society in Calcutta, with a request that they may state in what shape and extent they are willing to aid and co-operate with the Branch Association.

The meeting separated with a vote of thanks to the chair.

V. H. SCHALCH,

President.

Resolved—That the Society have heard with much pleasure of the establishment of a Branch at Balasore, and that the Council be requested to report on the nature and extent of the assistance that can be rendered in reference to the fifth paragraph of the Secretary's letter.

Communications on various subjects.

The following letters were also submitted:—

1. From R. B. Chapman, Esq., Officiating Under-Secretary to the Government of India, forwarding a report on the silk experiments at Lahore, by the Financial Commissioner of the Punjab. (Transferred for publication in the Journal.)

2. From James Cowell, Esq., Avignon, dated 2nd October, advising despatch of a quantity of French madder seed. The following is an extract of Mr. Cowell's letter:—

"In compliance with the request made to me, when leaving Calcutta, to endeavor to procure and send you some madder and other seeds, I write now to inform you that I arrived here from Marseilles on the 17th instant, having learnt at that port that the seed of the 'garance,' or madder plant, could be obtained here of better and more reliable quality than elsewhere. I have, I believe, succeeded in the object of my visit, having purchased, through the kind assistance of an English merchant here, 50 kilogrammes (about 112 lbs.) of fine fresh seed (just gathered), and which I have requested Mr. King to send to my agents, Messrs. Salvy and Co. of Marseilles, for transmission to you in a case, *via* Malta, by the P. and O. Company's steamer leaving that island about the 1st or 14th proximo. The case will be directed to you. Please apply for it immediately on arrival, and distribute the seed as soon as possible to such members of our Society in Upper India as will take any pains or interest in the cultivation of so valuable a root.

"The seed is sown here in the spring months (March, April, and May), but I think January and February will be the most suitable time for sowing in India. The hill localities will probably be the best for experiments, with a temperature of 60° to 80° Fahrenheit. The soil should be well and thoroughly loosened, and of a light nature. In Upper Scinde, and in the Punjab and Neilg herries, I think it is very likely to succeed, or that the chance of success

is greater there than in the lower provinces. The soil may be dug up after 12 or 15 months, and should then be dried in the sun; when dried, it has very much the appearance of our munjeet. Four cwt. of the fresh green root gives, when dried, 1 cwt. of the merchantable commodity. In this province the dried root is reduced to a powder by rollers, with the view of saving in freight, and this powder (garance) is then shipped largely to England, United States, &c.

"I fear there is no use of my sending you any seeds of the olive. The plant is produced from cuttings, and not from seed. I will see what I can do when I come this way again, or in Italy (Naples), where the olive is abundantly grown, and of the finest quality, and I will send you, if I can, some 'cuttings. The Valonica seed or acorn I will endeavor to obtain from Trieste or Smyrna.

"I have deemed it best to send you a large supply of the madder seed, as we may not again have an opportunity of procuring it under such favorable circumstances. I hope you will succeed in establishing this valuable article as an export from India. You may know that I have for some years past interested myself in this object.

"The Lahore Agricultural Society should be supplied immediately with this seed, and Mr. Cope's best attention should be solicited to its cultivation, which is simple and inexpensive. Directions for planting, &c., I have requested should be sent to you in the box."

Resolved—That the best thanks of the Society be communicated to Mr. Cowell for his kind and prompt attention to the Society's wishes; that the seed be distributed in the manner suggested, and to such other members as may express a desire to try it in suitable localities.

3. From C. B. Wood, Esq., reporting on the stick lac received from Mr. J. L. Atkinson of Cuttack, and submitted at the October meeting.

Agreed that a copy of this report be sent to Mr. Atkinson for his information.

4. From Captain W. H. Lowther, Suddya, dated 28th October, advising the despatch of the *Momordica* seed previously alluded to, and offering a few interesting remarks on other subjects:—

"Your 'red-flowered til' is now in full blossom, and promises an abundant crop; the pods are now swelling; it bids fair to be a dangerous rival in the market to the common country small-seeded description. People from all parts come to look at the field, and carry off the flowers to their homes as curiosities, so pray let me have a good supply of this seed when you can spare it, and get an opportunity, *i. e.* by June next. Only fancy the common country is just now realizing 3 to 4 annas per seer at Deebroghur, and little to be got: the demand immense, as an edible commodity. Both your batches of vegetable seeds have proved A 1 in quality. I never before saw so large a per-centage germinate at the same great distance from the sea; at least 60 per cent. of most descriptions are now healthy plants, past all risk. I thought the

growth of every thing quite wonderful. Did this extreme vitality originate with the *Comet*, or from atmospheric electricity prevailing in force at the period of sowing? The springing up of the cabbages, lettuces, endive, tobacco, gourds, &c., was almost magical, and the natives all declared I watered the seeds with some wonderful water from my *Dewaie khunah*. And now of the *Pierardia*. I find from the natives, with whom the 'lutkoo' is the favorite fruit, that not *one* seed in one hundred is sound or can be depended upon to vegetate, which is a pity I think, for, as I wrote before, it would be an addition to our dessert, under high culture. In opening a large packet of the seed I had made up for future transmission, I discovered that the native statement is quite correct, *not one* could I find in a mature condition. A servant of mine,

- who has a large tree of the *lutkoo* near his house at Debroo, assures me that, out of the thousands of seeds dropped there during many years past, the produce has been but two trees. I will make further researches in this matter, and let you know the result. I have lately been exploring some ancient ruins of cities in the very heart of our frontier forests (places now the dark abodes of tigers, Mishmee marauders, and jungle fever), and was delighted with the vegetation in the immediate vicinity of these relics. It had sprung entirely from the cultivated order of trees and plants—*Garcinias*, *Mesua*s, citron worts, *jasminums*, &c., &c. The beds of the streams being almost paved with the brick and stone debris of palaces and temples, and the more humble fragments of domestic vessels of yore, of the classic times of Koondelpore and Sissoopalnuggur, famous in Hindoo story. I am now sending you some newly gathered seeds of a very pretty '*Cucurbit*,' highly popular in Assamese cookery as 'Bat Kurreela,' so named from its outward alliance to the latter vegetable. This one, however, by cultivation, becomes deliciously palatable, and is as good and as wholesome as any plant of the order I know; but this is not the only quality—as a decorative climber in the fullest sense, where both nature and art work together, it is lovely; the foliage, the blossoms, the fruit, all well adapted to either ornament or design in reality, in wood, in stone, metal, or on paper. This found, when ripe, is orange colored, beautifully beset with spines like a hedgehog. In *Wight's Prodomus* I think you will recognize it as *Momordica mixta*, a perennial with a tuberous root: this root the natives plant out like yams. I will send you some of the cultivated seeds in my next: I think, but I am not quite certain, that I met with the plant once in a garden in South Bundelcund. This *Momordica* should have a sheltered situation under a row of maize, tall beans, &c. It should have morning and evening sun though, and plenty of rain. *Cucurbitaceæ* constitute a large proportion of our local flora. I shall send you the *handsomer* species in due season. Our gourds of edible species are few in number, and mainly contribute to feed the pauper classes—they are all suited to the European taste, however, when very young, and at a season when no other vegetables are procurable. The

want of labor in our province is greatly to be deplored ; it is truly a land flowing with milk and honey. No other spot of similar extent in the whole world can produce such varied treasures, be they animal, vegetable, or mineral : merely want a thoroughfare and inhabitants.

" I am just now superintending the clearing and guarding of a site near the great Dibong River, for the site of a fortlet, which is to hold in check those prowling marauders, the Mishmees of the mountains, by whose hands not a few villagers have been surprised and murdered within the last two years. We shall thus, in time, reclaim the magnificent lands surrounding those ancient cities above described, the richness of whose soil I cannot describe to you—tea, coffee, cotton, cane, indeed everything of commercial value would flourish there ; but where is the market, and where the roads, or the steam-bonts, rather ?"

5. From Mr. C. Sharp, Superintendent of the Barrackpore Park, the following note of his mode of cultivating the American maize, of which he submitted such fine specimens at the last meeting :—

" The maize (or Indian corn) I sent you was from the Society's American seed of 1857, and planted out between rows of cabbages in December 1857 ; as the corn came up, the cabbages were cleared away.

" Irrigation was carried on every fifteen days, until the plants showed flower, and then discontinued—the seed ripe in March 1858. The seed, a portion only from the aforesaid produce, were sown in June last, and the cobs I sent you are part of the produce of the June sowing.

" I have still about half a maund of such seed as I sent you for distribution to natives or other parties requiring it.

" My space for such things is limited, but, as an experiment, I will try this year's American in the same way, and let you know the result in due course."

6. From Lionel Berkely, Esq., Delhi, announcing that the vegetable seeds (Carter's overland trial assortment) have succeeded well in his garden, but that the fruit seeds have failed.

It was agreed, on the recommendation of the Council, to appropriate the sum of Rs. 160 towards the purchase of a set of *Curtis's Botanical Mazagine*, which had been offered for the Society's Library.

A few copies of the Society's Journal, Vol. X., part 2, just received from the press, were placed on the table.

For all the above communications and presentations the best thanks of the Society were accorded.

R E P O R T

OF THE

Agricultural and Horticultural Society

OF INDIA.

*Report from the Council to the Annual General Meeting of the
12th January, 1859.*

The Council beg to submit their usual Annual Report.

The subscription list and financial department first claim attention.

The Council are glad to announce that the number of elections during 1858, has been 102, considerably exceeding the general average (76) of the previous 12 years. It is also satisfactory to add that the deaths have been considerably less than in 1857, namely eighteen only.*

The following list shews, in detail, the present constitution of the Society:---

* The Honorable Major R. Byng; Lieutenant-Colonel J. G. Gerrard; the Right Rev. Dr. Wilson, Lord Bishop of Calcutta; Baboo Russickissen Mullick; Mr. J. C. Strover; Lieutenant-Colonel H. Garbett; Messrs. H. E. Cockerell, c. s.; J. R. Grey; E. F. Flouest; H. M. Low; C. C. Jackson, c. s.; A. Larruleffa; T. C. Loch, c. s.; D. H. Freeland; G. L. Young; Major W. Abercrombie; Captain F. C. Jackson; and Dr. Forbes Royle.

CLASSIFICATION.	In 25 previous years.	In 1846.	In 1847.	In 1848.	In 1849.	In 1850.	In 1851.	In 1852.	In 1853.	In 1854.	In 1855.	In 1856.	In 1857.	In 1858.	Gross Total.	Total real number at close of 1858 after deducting lapses.
Honorary Members,	11	1	0	1	0	0	0	1	0	1	0	2	0	0	17	10
Associate Members,	2	0	0	0	0	1	1	0	0	0	0	0	0	0	4	3
Corresponding Members, ...	0	1	0	0	0	0	1	1	1	0	0	0	0	1	5	4
Civilians,	232	13	15	22	8	10	22	16	12	6	23	23	17	19	444	166
Merchants & Traders,	201	14	12	13	10	14	20	12	5	16	18	31	11	20	397	130
Indigo and other Tropical Agriculturists,	190	15	6	5	1	9	19	13	10	7	14	12	10	14	325	106
Military Officers, ...	160	10	11	11	11	9	34	18	22	19	26	22	12	14	379	130
Medical Officers, ...	80	0	2	3	5	7	4	5	3	4	6	9	3	3	134	28
Asiatics, ...	63	2	14	5	6	9	8	8	8	5	5	7	14	19	173	71
Clergy, ...	14	1	0	0	0	2	1	1	1	1	2	1	2	0	26	9
Law Officers,	40	1	0	0	6	4	6	3	1	3	6	2	1	5	78	27
Miscellaneous, ...	9	0	2	0	2	2	6	0	0	10	0	0	2	7	40	30
	1002	58	62	60	49	67	122	78	69	72	100	109	72	102	2022	713

The lapses alluded to in the last column comprise, as above mentioned, 18 deaths, 42 resignations, and 8 removed from the list in accordance with Section VI, of Chapter III, of the Bye-Laws, the limited period of absence from India (4 years) having expired, making in all 68.

Of the total number of members (713) introduced in the last column, 33 have compounded for their subscriptions, 106 are absent from India, and 17 are Honorary, Associate and Corresponding; in all 156; leaving 558 as the actual number of paying members at the close of the year.

Among those who have been lost to the Society by death, the Council have to record with much regret the name of Dr. Forbes Royle, for 17 years an Honorary Member. The unceasing interest which Dr. Royle evinced in most questions connected with the

*It should be 104, the names of Mr. G. D. Turnbull and Col. W. J. B. Knyvett having been erroneously introduced in the obituary list of 1857.

development of the productive resources of this country, naturally led him to take an active part in the various subjects continually coming before the Society, and to forward its views to the best of his ability: The loss of a Member and Correspondent who has assisted so much towards the advancement of Indian agriculture and horticulture is most severely felt and deplored.

The financial position of the Society may also be regarded as altogether satisfactory, as the annexed statements will shew. From these it will be seen that the total receipts during the year have been Rs. 31,509-7-6, and the disbursements Rs. 30,681-4-9. The total liabilities amount to Rs. 9,400. To meet this there is the amount due for arrears of subscription, for seeds, plants, &c., and the cash balance, forming a total of Rs. 13,157.

Only two exhibitions were held during the year, the occupation of the Town-Hall by troops not admitting of the third being held, as usual, in the month of April. The Horticultural department of the January show was deemed altogether very satisfactory, and the competition in the floricultural department was greater than at the January show of 1857; and at the March show the display of vegetables and fruits was equally as good as that of March of the previous year, and the collection of ornamental plants far better. There was a large attendance of visitors at both shows, especially at the first. The sum of Rs. 878 and 4 bronze medals were distributed on these occasions.

The importation of vegetable and flower seeds from England, North America and the Cape of Good Hope, appear, on the whole, to have afforded satisfaction. A second trial assortment of seeds of field crops from Messrs. Gibbs and Co. of London, have however, the Council regret to add, proved so decided a failure, that they have recommended that the order for 1858 be given to Messrs. Carter and Co., and that a small additional supply of cereals be obtained from Messrs. Villet and Son of the Cape.

The Society have been called on during the year to meet certain applications for seeds for soldiers' gardens, to which they have responded to the best of their ability. In reply to a reference

previously made on the subject, it was stated that the Right Honorable the Commander-in-Chief did not consider it necessary, under the then existing circumstances, to avail of the Society's offer of obtaining seeds for soldiers' gardens; but, as demands were, notwithstanding, preferred for certain localities, the Council have thought it desirable to cause another enquiry on the subject to be made to the Military authorities, as it is not improbable that applications on a larger scale will be preferred for next season, which the Society may not be able to meet to the required extent from their own resources.

The Society have disseminated agricultural seeds in various quarters, more especially to Captain Stewart, the Officiating-Superintendent of Cachar, to whom they have sent a large supply, and the distribution of which he reports as a great success among a class of people who have been hitherto dependent on one staple only, rice, which proved a failure last year in Eastern Bengal generally, causing much misery and destitution.

From the Cotton Supply Association of Manchester the Society have received a ton of New Orleans cotton seed, which they have been distributing as judiciously as possible, on the understanding that the recipients communicate in due course the result of their sowings. A small quantity sown in the Society's garden has germinated readily.

It was stated in the last report that though the demand for plants during 1857 had exceeded all previous years, except 1856, it would no doubt have been greater, but for the unsettled state of the country. The operations of 1858 have proved the correctness of this remark. A statement submitted by the Officiating-Gardener shews that from 1st January to 31st December, 1858, nearly 19,433 plants have been distributed, being an increase of upwards of 6,000 on the distribution of 1857. In this number are comprised nearly 7,000 fruit grafts and trees, and a quantity of other useful plants such as coffee, vanilla, &c.; while the remainder (9,604) is made up of purely ornamental plants. During the past year 192 delivery orders have been granted, against 146 in 1857.

In addition to the above, it should be mentioned that the distribution of plants beyond sea has considerably increased. Forty-eight

glazed cases have been transmitted to various places as per subjoined statement :—

To England, by overland steamers, by steamers and sailing vessels viâ the Cape,	14
To Mauritius, principally by sailing vessels,	7
To Penang, by steamers on the China line,	3
To Rangoon, by the Burmah Steam Navigation Company's steamers,	16
To Moulmein by ditto,	2
To Arracan by ditto,	6
Total, ..	48

Besides 4 cases to Assam by the Government steamers. A few more cases are also in hand to be forwarded in January.

The above-mentioned increase in the distribution has necessarily augmented, in a proportionate degree, the work in all departments of the Garden. For propagating in the ornamental department it has been found necessary to introduce *cutch* beds in addition to the old *pucka* ones; they have proved useful auxiliaries, and been found to succeed remarkably well, at a trifling expense, for plants of a *robust* character, by choosing cool and tolerably dry localities. In this manner many kinds of roses have been freely propagated; also the beautiful green-striped bamboo of China and the gigantic bamboo of Burmah. Mr. Manuel has been successful in raising *Araucarias* from cuttings, which, with the fine *Thuja* species and the beautiful *Cupressus funebris*, propagated from plants and seeds received from Mr. Fortune in 1855, have been distributed to a limited extent. There has been a good demand for *Amherstia nobilis*, of which 72 plants have been distributed in the course of the 12 months. An equal number was almost ready for distribution, when the gale of the 25th October took place, and destroyed half of them. Notwithstanding the extended call on the garden, there is still a large stock available for distribution; about 15,000 plants.

From the Orchard department, though the distribution has been active as already noticed, there is still a good supply on hand to meet demands during the early part of 1859 of various kinds of fruit grafts. Among others, the Mauritius mango may be mentioned,

which has been thriving exceedingly well; several plants of Nutmeg and Mangosteen from the stock contributed in 1857 by Mr. Anthony of Penang, have been removed from pots, and planted out in suitable spots, where they are now thriving well. The Manilla hemp plant (*Musa textilis*) is now being freely propagated, and several plants have been distributed: these derive their origin from a single plant presented by Mr. Ackland in 1853: the older plants blossomed during the past season, but did not produce any fruit. Another plant, the "Woondée" of the Deccan (*Callisacion longifolium*), which has been many years in the garden, having been presented by Mr. R. Chew so long ago as 1839, blossomed, it is believed for the first time, this year. This tree yields a luscious fruit differing in taste from any on this side of India. Several seedlings have been raised, and grafts prepared. The fine betel-nut and cocoa-nut plants presented by Mr. Joseph Agabeg in 1850 have also recently blossomed, which will probably give a good supply of fruit for propagating purposes. The Carob (*Ceratonia siliqua*) raised from seed presented by Mr. Henry Abbott of Cairo in 1844, also blossomed last year for the first time, but did not perfect its fruit. A large number of seedlings of this valuable tree is now in stock from seed received from England in 1857. Several other plants in this department might be alluded to, but that it would swell out this report to an inconvenient length.

In the department of economic products, due attention has been accorded to various fibre-yielding plants (7 in number), to yams of sorts, including those from China, and New Zealand; also arrow-root, tapioca, ginger, sugar-cane, Guinea-grass, ground-nuts, (*Arachis hypogea*) vanilla, cotton, &c. The pods from *Vanilla aromatica* and *planifolia*, to which allusion was made in the last report, as having been sent to the London Society of Arts, have been favorably reported on (see *Journal*, Vol. X. p. 115.) In addition to the three plots previously under cotton, two others have been recently laid out with plants raised from seed, presented by the Government of India, with plants raised from the Sea Island and Petti-gulph seed received from the Society's seedsmen at Philadelphia, and plants from New Orleans seed presented by the Manchester Cotton Supply Association. All the available space in

the kitchen garden is fully appropriated: besides the ordinary vegetables, a good extent of ground has been laid out with American maize, and a still larger plot (nearly 70,000 square feet) with peas of all kinds, to meet a probable large demand next season for soldiers' gardens, and elsewhere.

The Council regret to mention that there has been no demand for the Chinese green dye plants, though frequently brought to notice: there is a large stock of this useful plant still on hand, for those who would wish to cultivate it for the sake of the color it affords, and which is now so highly valued in Europe, more especially in France, where the dye has been recently selling as high as Rs. 135 per pound!

The Society are indebted to several contributors during the past year, more especially to Dr. Thomson, Superintendent of the Botanic Garden, Calcutta, to Captain Ledbitter of the "Swathmore," to Captain F. W. Ripley of Arracan, Captain E. H. Power of Rangoon, and Mr. W. Stalkartt.

The Society has been in correspondence during the year with the Right Honorable Sir Lawrence Peel, regarding a Gardener. Sir Lawrence has secured the services of a competent person, who will probably arrive in the early part of 1859.

It was stated in the last Report that the time expired on 31st December, 1857, for which prizes had been offered for certain staple articles, for efficient substitutes for others, and for essays on certain subjects. It was agreed at a meeting in the early part of 1858 to extend the time to the 31st December, 1858, in consequence of the promotion of the special objects of the Society having been considerably impeded during 1857, owing to the disturbed state of the country. At the following meeting the Special Committee submitted a revised list of premia, omitting a few articles and substituting two others, namely for the successful introduction and cultivation of madder (the produce of *Rubia tinctorium*) and for a cheap substitute for gunny-cloth for packing purposes. There has been no competition during the past year for the prizes offered for staple articles, and only one essay has been sent in, which is under adjudication.*

The Society have received during the past twelve months many samples of various articles, such as coffee, tea, cotton, vanille, gamboge, resins, gums, farina as substitutes for arrow-root and tapioca, fibres of sorts, &c., on most of which reports have been furnished by the respective Committees to the contributors. It may here be stated that some interesting information has been published in a recent number of the *Journal* respecting an useful substance from the Tenasserim Provinces called Pwainyet, and the little bee which produces it, collected from notes furnished by the Rev. Mr. Parish of Moulmein and Mr. F. Smith of the British Museum. The substance itself which, it is probable, might be applied to several useful purposes, has been forwarded to the Society of Arts for examination and report.

• It is gratifying to announce the recent establishment of a Branch Society at Balasore. It has been originated by a member of the Society, a native Zemindar, Baboo Puddolochun Mundul, who is much interested in the improvement of the vegetable resources of the district. Judging from the report of the preliminary proceedings which were submitted at the December meeting, this Branch Institution promises well, and can scarcely fail to prove most useful, if the steady co-operation of the other leading landholders can be secured.

Among other subjects that have engaged the attention of the Society during the past year, the Council would wish to record, more especially, that advantage has been taken of Mr. R. Fortune's return to China in the service of the Government of the United States of America to re-open a communication with him. Previous reports, particularly those of 1854 and 1855, record the benefits experienced by the Society on a former occasion through the agency and zealous co-operation of Mr. Fortune. Mr. Fortune has again kindly promised to use his best endeavours to obtain seeds and plants from China, and the Superintendent of the P. and O. Company, Messrs. Jardine, Skinner and Co., Gladstone, Wylie and Co. and Apear and Co., have most liberally expressed their readiness to allow such cases to be forwarded free of freight by the steamers for which they are

Agents. A communication has also been opened with Dr. Walker, Superintendent of Port Blair, to whom a quantity of seeds has been supplied for the use of the convicts in the new settlement of the Andamans, and he has already commenced to reciprocate by the despatch of plants from those Islands. Application has likewise been made to Dr. Livingstone, for seeds and roots of such African plants as he may consider desirable for introduction into India.

The Society have recently voted a silver medal, with a suitable inscription in Persian, and a parchment certificate, to Juffer Allee, a resident of Darrea, in the Pergunnah of Shukurghur, Goordaspore, as the first zemindaree planter of mulberry trees in the Punjaub, for rearing silk-worms.

Monsieur Natalis Rondot of Paris, the author of a most interesting and useful treatise on the Chinese green dye, has been elected a Corresponding Member of the Society.

Lastly, the Council have to report, that during the past year two numbers of the *Journal* have been published, viz. in June and December, both containing several interesting papers, among others notes on the indigenous plants of Bengal; on experiments with cross-breeds of the silk-worm; on the culture of English vegetables in the environs of Calcutta; an account of the silk trade and silk manufactures of the Punjaub, and on the introduction of the silk-worm into that province; the production of palm sugar in Pegu; the progress of tea cultivation in Cachar and Darjeeling; on the introduction of the quiniferous Cinchonas of South America into India; and various reports on tea, coffee, oils and fibrous materials.

Statement of Receipts and Disbursements of the Agricultural and Horticultural Society of India from 1st January to 31st December, 1858.

RECEIPTS.

From Members, Subscriptions collected during the year,	Co.'s Rs.	17,241	11	6
„ Government Annual Donation,	5,000	0	0	
„ The Right Honorable Lord Canning's annual donation for the year 1858,	500	0	0	
		5,500	0	0
„ Accruings of interest on Government Notes,		813	5	4
„ Government of Bengal for 26 cases of seeds supplied by Messrs. James Carter and Co. on account of Soldiers' ...	3,677	4	8	
„ Secretary A. and H. Society, Punjab, for 2 cases of English vegetable seeds supplied in 1857,	110	0	0	
		3,787	4	8
„ Proceeds of Sugar-cane delivered from the Nursery Garden, ...	178	4	0	
„ Ditto, fruit grafts delivered from the Nursery Garden, ...	994	4	6	
„ Ditto, of a proportion of surplus Cape and American vegetable and English flower seeds of 1857-58,	1,590	1	6	
„ Ditto, of English vegetable seeds,	191	0	0	
„ Ditto, of sale of 24 Mds. and 19 seers of Linseed,	59	10	3	
„ Ditto, of sale of 5 Mds. and 10 seers of acclimated peas, ..	95	0	0	
„ Ditto, of <i>Journal</i> of the Society,	68	8	0	
„ Ditto, of <i>Indian Agricultural Miscellany</i> ,	29	10	6	
„ Ditto, of sale of old seed boxes and casks, &c.,	54	12	0	
„ Members, amount repaid for postage, pots, and packing charges for seeds, &c.	649	14	3	
„ Ditto, for glazed cases, &c.,	191	8	3	
„ Ditto, amount repaid for freight on boxes of seeds forward- ed in 1857-58,	63	4	6	
		4,165	13	9
„ John Cochrane, Esq. Official Assignee, being a further divi- dend on the Society's claim of Co.'s Rs. 100 against the estate of Messrs. Saunders, May, Fordyce and Co.,		1	4	3
Total Receipts, Co.'s Rs., ..				
31,509 7 6				
By Balance in the Bank of Bengal on 31st December, 1857, ...	2,145	7	5	
„ ditto in the hands of the Secretary on ditto,	15	3	0	
		2,160	10	5
Grand Total, Co.'s Rs., ...				
33,670 1 11				

DISBURSEMENTS.

FOREIGN VEGETABLES AND FLOWER SEEDS.

By Messrs. C. M. Villet & Son for Cape Garden seeds supplied in 1858, ...	1,888	0	0
„ Messrs. D. Landreth and Son in part for American Garden seeds, &c., supplied in 1857,	1,000	0	0
	2,888	0	0
Carried over, Co.'s Rs.,' ...			
2,888 0 0			

Statement.

clxxxv

	Brought forward, Co.'s Rs.,	...	2,888	0	0
„ Messrs. James Carter and Co. in full of their bills, amounting to £306-13-3 for English vegetable, and flower seeds, &c., supplied in 1857,	...	...	3,066	10	0
„ Messrs. Thomas Gibbs and Co. in full of their bills amounting • £107-8-3 for seeds of field crops supplied in 1857,	...	...	1,074	2	0
„ Messrs. James Carter & Co. in full of their bills amtg. £367-14-7 for 26 cases of seeds supplied for Soldier's Gardens,...	...	...	3,677	4	6
„ Sub-Treasurer for a box of seeds intended originally for Soldiers' Garden at Dum-Dum, but taken over by the Society,	...	...	20	0	0
„ Messrs. Rabaud Brothers and Co. (through Messrs. Charles Cantor and Co.) for a box of olive seeds,	...	...	9	5	6
					<u>10,735 6 0</u>

LIBRARY.

By Books purchased during the year for the Library,	...	...	366	7	9
„ Binding books during the year,	...	...	17	12	0
					<u>384 3 9</u>

PRINTING.

By sundry parties for printing receipts and schedule of prizes for flower shows, &c., &c.,	38 8 0
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JOURNAL.

By Bishop's College Press, for printing, &c., 700 copies of Journal Part, 1 Vol. 10 of the A. and H. Society, including a General Index of the Transactions and Journal,...	892 12 0
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NURSERY GARDEN.

By Ordinary expences incurred on account of the Nursery Garden from 1st December, 1857, to 30th November, 1858,	3,841	11	0
„ Extra ditto, for purchase of fruit seedlings for grafting, for glazed cases, pots, for widening and repairing roads, for thoroughly repairing old conservatory, building a new one, and for sundry other contingent expences,	...	...	1,692	11	9
„ Messrs. Charles Cantor and Co. for letter of credit to Sir Lawrence Peel for Gardener's passage money, &c.,...	...	...	1,043	9	0
„ Messrs. Gisborne and Co. for supplying 3 casks of Guano,	...	...	146	2	6
„ Half maund of Jerusalem Artichoke tubers for the Society's Garden,	...	...	3	0	0
„ Messrs. G. F. Lackersteen and Co. for 2 wheel-barrows, &c.,	...	...	53	0	0
					<u>6,780 3 0</u>

ESTABLISHMENT.

By Amount for establishment from 1st December, 1857, to 30th November, 1858,	8,557 4 0
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PECUNIARY REWARDS.

By Prizes to Mallees for vegetables and fruits at exhibitions held on the 29th January, and 10th March, 1858,	577	0	0
„ Ditto to ditto, for flowers at ditto, on the 29th January, and 10th March, 1858,	...	...	301	0	0
					<u>878 0 0</u>

ADVERTISEMENTS.

By Advertising notices of general meetings, of shows of vegetables and flowers, distribution of seeds, offer of premia, &c., &c.,	83 15 0
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Carried over, Co.'s Rs., ... 28,550. 2 9

STATIONERY.

Brought forward, Co.'s Rs., ..	28,550	3	0
By Stationery for office books, &c., and for the use of the office, ...	77	14	0
„ Brown packing paper for packing seeds,	97	10	0
			<hr/>
			175 8 0

FREIGHT.

„ Freight on boxes of seeds, books, &c., sent and received from the Cape of Good Hope, America, &c.,	348	0	0
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METCALFE HALL.

„ Society's proportion of assessment on the Metcalfe Hall from October, 1857, to September, 1858,	157	8	0
„ Ditto of ditto for lighting tax from Oct. to September, 1858, ...	42	0	0
„ Messrs. Modosuden Roy for Society's proportion for inspecting and looking over the Metcalfe Hall Building from April, 1857, to March, 1858,	20	0	0
			<hr/>
			219 8 0

FURNITURE.

„ Administrator-General for a portrait of Sir Lawrence Peel, ...	100	0	0
„ Mr. DeLaHogue for cleaning and varnishing the likeness of ditto,	32	0	0
„ Gones Doss for repairing gilt frame of ditto,	10	0	0
„ Sundry articles of furniture,	43	9	0
			<hr/>
			185 0 0

PETTY CHARGES.

„ Sundry charges, including postage on letters, &c., sent and received, and for copies of the Journal,	604	8	0
„ Extra writer and packermen for subdividing seeds, and writ- ing on papers,	34	4	0
„ Soldering tin boxes and lining wooden boxes with tin, sent to Non-Resident Members,	50	1	3
„ Expenses incurred in putting up a fence round a portion of the Auckland Circus, &c.; for superintending the erection of tents for flower and vegetable shows for the season, ..	151	11	0
„ Presents to constables for attending at Horticultural and Floricultural Exhibitions during the year,	64	0	0
„ Mr. Bartlett for illuminating the two Gates of the Metcalfe- Hall on the day of the proclamation of the assumption of the Government of India by Her Majesty,	175	0	0
„ Messrs. Grindlay and Co., being balance due to them as per account dated 11th and 31st December, 1857,	117	14	6
„ Secretary Bank of Bengal for renewing notes, and for fees and commission,	5	0	6
			<hr/>
			1,202 7 3

Total Disbursements, Co.'s Rs., ...	30,681	4	0
By Balance in the Bank of Bengal on 31st December, 1858, ...	2,973	2	2
„ Ditto in the hands of the Secretary on ditto,	15	11	0
			<hr/>
			2,988 13 2

Grand Total, Co.'s Rs., . 33,670

Statement.

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MEMORANDUM.

DISBURSEMENTS.		RECEIPTS.	
To Amount of Disbursements during the year 1858, as per Statement, ...		By Amount of Receipts during the year 1858, as per Statement, ...	
Balance in the Bank of Bengal on 31st December, 1857, ...	30,681 4 3	Balance in the Bank of Bengal on 31st December, 1857, ...	31,599 7 2
Ditto in the hands of Secretary on ditto, ...	2,973 2 2	Ditto in the hands of the Secretary on ditto, ...	2,145 7 5
	15 11 0		15 3 0
	2,988 13 2		2,160 10 7
Total, Co.'s Rupees,	33,670 1 11	Total, Co.'s Rupees,	33,670 1 11
LIABILITIES.		DEPENDENCIES.	
Amount due by the Society for African seeds of 1857-58, ...		Amount invested in Government Securities lodged in the Bank of Bengal, ...	
Ditto for Agricultural seeds from England, received in 1858, ...	6,000 0 0	Ditto of Subscriptions in arrear, ...	20,333 5 5
Ditto for English flower seeds, of 1858, ...	1,095 0 0	Ditto of outstandings for seeds, grafts, copies of Journal, &c., &c., ...	8,469 6 6
	2,305 0 0	Ditto of outstandings for seeds against A. & H. Society, Punjab, ...	1,181 8 6
	9,400 0 0		518 0
			1,699 8 6
			10,168 15 0

that, if he could find them a market, they were ready to grow large quantities. I have submitted a sample to Mr. Steiner, late Superintendent of flax operations in the Punjab, and will communicate his opinion."

Mr. Stalkartt (a Member of the Fibre Committee) reports on this flax as being very soft, of good quality, and fine fibre.

19. Specimens of a substance called by the hill people "kuff" or "kuffee," the downy filament on the under side of the leaf of a plant called "sookta" (*Chaptalia gossypina*, syn. *Oreoseris lanuginosa*.) Presented by General H. C. M. Cox and Lieutenant W. A. Ross.

Before reading the following extracts of letters from General Cox and Lieutenant Ross, the Secretary stated that the "kuffee" had been several times brought to the notice of the Society, first by Dr. Falconer, in 1836; then by Major Charlton, in 1850; again by Captain Lowther in 1855; and in the early part of last year, by Captain D. Briggs; the last-named officer was requested to send several seers of it to admit of a fair experiment as to its capability for manufacturing into paper of a fine quality; but the Society had not heard further from him on the subject:—

Extract of a letter from General Cox, Mussooree, dated 3rd August 1858.—"Some months since Captain Briggs suggested to the Society, as an article calculated to make paper, the film found on the under side of the leaf of *Oreoseris lanuginosa*, which grows abundantly on these hills. Long before Captain Briggs' suggestion appeared, I had collected and taken some to England in 1855, with the intention of submitting it to some paper manufactory for trial; my brief stay at home, however, and other causes prevented my doing so. I am now collecting more of it to take home as an experiment, but without an idea, even if it answers the purpose, that it can be collected and exported in such quantity as to become an article of trade. The following result of my experiment will, I think, substantiate my opinion:—

"I had a seer of the leaves weighed and the film separated, the product was three-quarters of a chittack of film from 1 seer of the leaves, or, to state it in the nearest approximating English weight, 2lbs. avoirdupois gave 1½ oz. of film; consequently 1 cwt. or 112lbs. of the leaves would only produce 5lbs. 4 oz. of the film, and 1 ton of leaves less than 1 cwt. of the film. The plant, though common, produces only from three to four leaves, varying in size; I send you in a separate envelope four leaves, showing the different sizes, one a very large leaf, with the film unremoved from any of them, and a small quantity of the film."

In a subsequent note, dated 27th August, General Cox thus writes:—"I have the pleasure to acknowledge the receipt of your letter of the 14th instant. The maximum number of leaves on each plant is eight, the minimum three. I pay *one anna* to a coolie for a *kunder* or hill basket of leaves, weight

about 12 seers, and the product 1lb. 2oz. of the film; separating the film costs about one anna more, or two annas for 1lb. 2oz. In some cases the leaves get blighted by the continuous mist and fogs which prevail here, and on examining the under side of the leaf, one-half will often be found of a brown tinge, and whenever this is the case the film will not separate."

Extract of a letter from Lieutenant W. A. Ross (Bengal Artillery), dated Murree, 25th July 1858.—"I have the pleasure of enclosing you a substance which the natives call 'kuff,' peeled off the leaves of a plant called by the puharries 'sokhta,' and which they use instead of tinder for their matchlocks, &c. About two years ago some of my acquaintance showed me this leaf at Simla, recommending it as capital stuff for a 'feleeta' for cheeroots, and on looking at it closely, it immediately struck me that it was very like the pulp of which the finest paper is made, and I had thoughts at that time of sending some of it to Messrs. Fourdrinier, the large paper manufacturers in Staffordshire, with whom I am acquainted. But, perhaps, it will be better to send you some specimens with this brief account for publication, in order that, if paper of a finer quality is made at all in India, it may be tried here first. The plant 'sokhta' is exceedingly common in the Himalayas, and is found over their whole extent from Murree to Almorah, at both of which places, as well as Simla, I have found it. When the leaves are damp and green, the 'kuff' is peeled off the back of the leaf with great facility and quickness, so much so, that it is a peculiarly pleasant occupation, and especially suited for the small delicate fingers of women, boys or natives.

"I should think, by a little cultivation, the 'kuff' would be much increased on the back of the leaf of the 'sokhta,' and be more likely to make good paper.

"I believe the supply of rags for paper-making has very much diminished in England, so much so, that the *Times* paper has offered a large reward for a substitute. I don't think this 'kuff' would make the stronger and larger kinds of paper, but am pretty certain it would be available for that of the finest and most delicate kind. I enclose also a small leaf of the 'sokhta' plant, quite fresh and green, but I suppose it will have dried up by the time it reaches you."

In a subsequent letter, dated 2nd August, Lieutenant Ross gives the following additional particulars:—

"In reply to your letter of the 14th instant just received, I beg to assure you that I was quite aware of the notice the plant 'kuff' had formerly received from Indian botanists, as well as its capability for various manufactures, but what I wished to suggest, was its apparently peculiar susceptibility of being made into the pulp, from which the finest paper

could evidently be made, and it was I who suggested this susceptibility to Captain Briggs in walking down one day, in 1856, from Simla to Lolon.*

"The *plant* is a mere weed, and covers the whole of the unwooded hills in the *very greatest profusion*. The collection and disengagement of the down from the back of the leaf would cost little or nothing, but I will try, for your information, how much *one* cooley can obtain and disengage in *one* day.

"With regard to the 10 seers, I can easily obtain that, or a much larger quantity for you, and I will despatch it to your address as soon as possible.

"Besides the above, I will try and procure for you the following information regarding this little plant :—

"1st.—In what proximity to the plains it can be found.

"2nd.—How far in the interior of the hills, and towards the snow ditto.

"3rd.—At what season the leaf bears the greatest amount of the 'kuff.'

"4th.—If the leaf would be enlarged, or the 'kuff' increased by *cultivation*.

"With regard to the carriage in this country and freight to England of the 'kuff,' I should think it will cost less than those of most other substances, from its extreme lightness and capability of being closely packed.

"I would also beg to suggest, that as 'gun paper' has been found almost as efficient for blasting and other purposes, and a great deal cheaper than 'gun cotton,' the 'kuff,' from its already combustible nature, being largely used for tinder, might prove a very superior element in the manufacture of the former.

"At any rate, of whatever use this substance may be found, these facts regarding it are undeniable, *viz.*, that the supply is inexhaustible, the cost of collection and preparation little or nothing; and the carriage and freight as small as that of any useful substance can be."

Resolved—That on receipt of the quantity promised by Lieutenant Ross, it be forwarded to the Society of Arts for trial and report by the first paper manufacturers.

20. Samples (white and yellow) of raw silk from Deenanuggur, in the Punjab. Presented by H. Cope, Esq.

Mr. Cope states that this silk has been grown and prepared by a Cashmerian, of the name of Jaffer Ali, a resident of Deenanuggur, and that the people at Umritsur offer Rs. 16 a seer of 96 tolahs for it.

(Further particulars regarding this silk, which is considered very fair for a first experiment, will be found in the body of the proceedings.)

21. Samples of coffee and cassia from the Deyra Dhoon. Presented by H. G. Keene, Esq.

"I have despatched to your address," writes Mr. Keene, "a specimen of coffee grown by a native landholder in this district, and shall be happy to receive and communicate to him your Society's opinion thereon. I have put in with the coffee specimens of cinnamon (or cassia ?) from Jounsa Bawur, the hill pergunnahs of this district. Two or 3,000 lbs. are now available."

The coffee had, unfortunately, been put in an air-tight tin box in a green state, and had, consequently, reached in too mouldy a condition to admit of a fair opinion being formed, but it seemed to a member of the Committee to be a good description of coffee. The cassia is pronounced of good quality.

Nursery Garden.

The Officiating Gardener's monthly report was submitted. After alluding to the receipt of cases of plants from Captain Power of Rangoon, and the Botanical Garden at Jamaica, Mr. Manuel proceeds as follows :—

"The imported vegetable seeds received for the present season are from Messrs. Gibbs and Co., of London; Messrs. Villet and Sons and Mr. Templeman, both of the Cape; and Messrs. David Landreth and Sons, of Philadelphia. All the trial sowings were immediately made in the usual way, after examining each packet, which I found in good condition. The tabular statement of each sowing I beg to enclose.

"Of the entire batch I found the American seeds to be unexceptionable, and feel greatly satisfied with the result. I may add that the present importation is, I consider, far superior to that of last year. As I had made both sowings myself, and had carefully watched their progress, the result fairly shows the present to be superior to that of the past season; and I expect, when the regular sowing season arrives, the issue will fully bear out my expectation.

"Next to the American seeds is that of Messrs. Villet and Sons, whose imported seeds of the present year are fully equal to that of the last; and I may add, that from the past year's seeds I took great care in rearing the onions and celery, both of which had germinated very satisfactorily; both were laid out in open beds, where they remained for the whole of the year, withstood the severe heat of this year, and the heavy rains of July and August. The celery is now coming into bloom, and I expect it will seed.

"Mr. Templeman's comes next in the list, and which I find as good as that of last year; though a few failed to germinate, yet I consider, if I allow another trial, it may redeem their character. When the season for laying all out in the open ground freely admits of doing so, it will be carefully watched to mark its progress, and the result accordingly submitted.

"As to the seeds received from Messrs. Gibbs and Co., a little disappointment is felt, inasmuch as the result of the past years shows better than that of the present, as will be seen from the tabular statement of the present year's sowing. Besides this sowing I gave another trial, but the result proved as unsatisfactory. I am unable to attribute the failure of the few seeds to any reasonable cause, as the seeds seemed to be fresh on examination. The only cause to which this can be attributed is that, perhaps, such seeds were in a package which might have been stowed in some part of the ship where excessive heat may have destroyed their germinating properties. The seeds received last year were very good, as each kind of field crop had not only freely germinated, but yielded a good return, especially the carrots, turnips, raddish, and the far superior beet which, in size, both yellow and red, was astonishingly great.

"Of the vegetable seeds received from Messrs. Carter and Co., by overland, and the report of the trial sowing given in my last, I beg to add that since then the following seeds have germinated, and I consider has yielded a good return.

Cabbage, Carter's matchless,	yielding 40 per cent.		
Endive, curled,	do.	50	do.
Lettuce, compact,	do.	30	do.
Parsley,	do.	70	do.
Spinach,	do.	30	do.

And the number failed are the celery, leek, onion and Brussels sprouts.

"I beg to forward for distribution the present year's crop of maize raised from the acclimated seeds, the produce of the garden of past year. These I raised from a small quantity of seeds which I had retained for sowing in the present year. Of the imported American seeds of last year, the quantity I had retained for sowing, I regret to say that I failed to obtain a crop. Of a quantity which had germinated, some withstood the severe heat of the past season, but others flagged much, and, consequently, gave no produce. As both seeds were simultaneously laid down, the failure of American seeds I attribute to the excessive heat which prevailed at the time, and which was, the least to be said, unexpected, the average Fahrenheit averaging from 130° to 132° out-doors. The small quantity of seeds I received from Mr. Butler, I had retained for a more favorable season, and when these were laid down, the sudden heavy showers of rain tended much to destroy them; however, I have obtained a small crop, which I consider to be satisfactory. They are of good kind, and full in ear.

"I regret to add that the same unfortunate result attended the present year's crop of jute, and the two kinds of *Hibiscus*, (the sorrel plants.) Though the seeds freely germinated, yet, owing to excessive heat and want of

good showers of rain at the time of germination, all the plants have, more or less, suffered in being stunted—and though the rains came on pretty well in July and August, yet the plants could not well revive—and now the rains having so suddenly ceased, and the sun again becoming powerfully hot, will tend to no good benefit to these plants before they come to maturity. But I may say that, in looking to the growth of the plants laid out by the ryots in the fields adjacent to the garden, I find mine to be of better growth ; the poor people lamenting much their loss in the jute and sugar-cane crops, which, to them, have been a complete loss.

“I also regret to say that the English acorn seeds received from Reverend Dr. T. Boaz have failed to germinate. The failure of these I chiefly attribute to their arriving here too late in the season.

“As the season freely admits of planting out fruit grafts and other trees, I may add that I have still remaining some mango and other grafts, and have added to the stock of ready grafts of peaches of all kinds, and a few, about five kinds, of pummelows—and other grafts—all of which are available to members. Besides these, I have remaining out of the batch of plants presented by Dr. Thomson, of the Honorable Company’s Botanic Garden, some good and ornamental kinds of plants, and fine timber-yielding trees, which would make good plants for large and extensive gardens, and which can be had on payment of pot charges. These plants comprise various kinds of palms and other trees, *viz.* *Guatterias*, *Dilleinas*, *Bauhinias*, *Semecarpus*, *Mimrops*, *Gardenias*, *Michelias*, *Carreyas*, *Sapindus*, *Pterospermum*, *Aglaias*, *Berryas*, *Shoreas*, *Neriums*, *Bignonias* *Nephilum*, and *Combretums*.

“I beg to forward specimens of fibres from three kinds of fibre-yielding plants: two are from the *Papeng shaw*, which I failed to extract last year ; one from *Sida rhomboidea*, and one of dhuncha, which I had likewise failed to extract last year. The experiment made on the *Papeng shaw* was in two ways, and the result, as succeeded, is now submitted. One process was, that I stripped the bark and immersed it in water, keeping the same for fifteen days ; and the other was to strip the bark and to allow the process of fermentation to take place before immersing the same in water, which took place in forty-eight hours, and remained immersed in water for seventeen days, when I had them washed, and the refuse separated from the bark. I believe, as the specimen will show, that the bark does not admit of the process of fermentation, as that which is without has yielded a finer description of fibre, but the period it has taken to complete is, I consider, too long ; but this, I believe, arises in consequence of the plants being taken before they have arrived at maturity, and, therefore, I intend to make another experiment. The dhuncha fibres are extracted in the same way, and I don’t think, unless they are stripped of the bark, it will admit of their being extracted. Of the whole, I

consider the fibres of *Sida* to be the best ; however, I submit all for inspection of the meeting.

“ I also beg to forward two brinjals, the produce from the seeds received from Bombay, from Mr. C. B. Morgan. These are medium-sized ones, as those of the largest kind have run into seed, and therefore unable to send them for your inspection. I am of opinion that these brinjals are of very superior kind ; the largest, which is nearly treble its size, were found to be very tender and fine flavored, and therefore worthy of cultivation as the best of its kind.”

The recommendation of the Council, submitted at the last meeting, that the Rev. T. C. Firminger be elected a member of the Council in the room of Mr. George May, who has left India, was next brought forward and unanimously agreed to.

Fibres from Darjeeling.

A report was read from Mr. Stalkartt on the three samples of nettle fibres from Darjeeling, presented by Captain Masson, at a recent meeting, of which the following is an extract :—“ A portion of each of these musters has been passed over a flax heckle which, with its tow, I return. The fibre is strong, fine, and would make a good and, perhaps, superior substitute for flax, and might enter into the composition of linen fabrics ; its value can scarcely be determined here, but should be sent to the Chamber of Commerce, at Dundee, for valuation and demand. I beg that one portion (which has been heckled) be sent to Captain Masson, to guide him respecting the getting up of the material, which is absolutely necessary to make it sought after, with a view to large transactions. The preparers of this nettle and pooah fibres, after twisting it to take out the water, should be more careful when spreading it out to dry to twist it back again, and lay every fibre perfectly straight, or, in the process of heckling it, there will be a large proportion of tow, which should be avoided.”

Ordered—That a copy of the above report, and the prepared samples, be forwarded to Captain Masson.

**Silk Culture at Deenanagur, in the Punjab.*

Read the following letter from Mr. H. Cope, dated Umritsur, 7th June, on the above subject :—

“ Since I had the honor to forward my impressions regarding the introduction of the silk-worm into the Punjab, I have had some opportunities of seeing how really great are the advantages available in support of such a measure. I have seen vast tracts of waste lands, situated at the foot of the

hills, suited, in an especial manner, to the cultivation of the mulberry tree : better still I have seen in almost every village through which I have passed magnificent mulberry trees that would afford food for countless numbers of worms, and I have learnt that a considerable number of the Mahomedan population would undertake the rearing of these worms if they could see their way clearly.

" Amongst other places visited was Deenanuggur, a commercial entrepôt of some importance, situate in a fertile part of the Goordaspore district, near enough to the hills, to derive some advantage from that proximity with the Huslee Canal passing through its lands, and the promise of enlarged irrigation when the works of the Baree Doab Canal shall have been completed. It is not mentioned in any previous paper as one of those localities in which the silk-worm has, at any time, been introduced, but is admirably adapted for such an experiment. The mulberry abounds, and the climate is suitable in March and April.

" I was, therefore, much gratified to learn that a Cashmeeree, named Jaffer, with his son Rehman, had been engaged, for the last three or four years, in rearing the silk-worm ; that he had this year obtained 4 seers of silk, and was finally so well satisfied with his prospects of success, that he had *purchased* 8 beegahs of land for the purpose of forming a mulberry plantation, and this without any communication with, or encouragement, direct or indirect, from the European officers of the district. I had not time to see the man myself, but the facts are beyond a doubt, as I have ascertained through the obliging enquiries of Mr. Naesmyth, Deputy Commissioner of Goordaspore, and I believe it is the intention of that zealous officer to recommend Jaffer and his son to the consideration of Government, as deserving some pecuniary reward for their enterprise.

" I venture to consider this man deserving some mark of approbation at the hands of your Society, and that such a mark, bestowed through the local authorities, would have a very good effect in encouraging others to follow the excellent example set.

" I shall probably have early occasion again to visit Deenanuggur, and will report more fully on the experiment, but in the meantime beg to be allowed to recommend that the Society present Jaffer with a silver medal and a certificate in Persian, *on parchment* (hair-loom of this kind are very highly prized), stating that the members have heard with satisfaction of his efforts to raise silk at Deenanuggur, and hope they will meet with the success they deserve, or something to that effect.

" P. S.—I ought to have mentioned above that hitherto Jaffer has purchased leaves from the owners of *mulberry* trees, on which to feed his worms of the past year."

Read also a letter from Mr. Naesmyth, Deputy Commissioner of Goordaspore, dated 28th August :—

“ In reply to your note of the 7th instant, I have the pleasure to reply as follows :—

“ 1. Jaffer Ali has cultivated, with mulberry, 4 acres and 3 roods of land.

“ 2. He has cultivated the land for this purpose since May 1856.

“ 3. He has cultivated the above solely for silk-worm feeding.

“ 4. He has introduced the worm in his cultivation, which is progressing favorably.

“ 5. The above was entirely his own doing, and not at the instigation of any government official.

“ 6. He is anxious to extend the cultivation.

“ 7. Jaffer is the sole cultivator.

“ 8. I think the donation of a medal from the Society would be prized, and would

“ 9. Be likely to induce others to follow his example.

“ 10. The part of the country is well adapted for silk-worm feeding.

“ I shall be glad to supply any further information which may be required. Jaffer Ali has, at my recommendation, received a cash donation of Rs. 50 from Government for his exertions.”

Submitted also a recommendation from the Council, to the effect that the Society award its silver medal, with a suitable inscription in Persian, to Jaffer Ali, for the reasons set forth in the above communications.

Baboo Peary Chand desired to give notice of a motion to the above effect, for disposal at the next meeting.

The following extract from the proceedings of the Council, at their monthly meetings, held in August and September, were submitted, and ordered to be incorporated in the proceedings of this day's meeting :—

“ That a Sub-Committee, composed of the Reverend J. Long, Mr. W. G. Rose, and Baboo Peary Chand Mittra, be appointed for the purpose of reporting on the feasibility, or otherwise, of the establishment of Agricultural Schools in Bengal and the Upper Provinces, at the next meeting of the Council.”

“ In consequence of the publication of an extract from the despatch of the Court of Directors, requesting the Government not to incur any further expenditure in the Education Department, we beg to recommend that the consideration of the question, on which we have been requested to report, be postponed, until there is a change in the circumstances of the country to warrant the Society taking it up again.”

PEARY CHAND MITTRA.

W. G. ROSE.

.Communications on various subjects.

The following papers were likewise submitted :—

1. From Lieutenant R. Stewart, an interesting report on the progress of tea cultivation in Cachar.

The best thanks of the Society were voted to Lieutenant Stewart, and his paper transferred for publication in the number of the journal now in the press.

2. From Lieutenant J. F. Pogson, further remarks respecting a description of silk-worm found at Simla, and the fibre of the behul (*Grewia oppositifolia*), and rope made therefrom. Mr. Pogson also alludes to the recent flowering of the bamboo at Simla as follows :—

“ A good deal of curiosity seems to have been excited amongst horticulturists at the flowering of the bamboo, of which we have in these hills three kinds, *viz.* the gigantic or large, hollow bamboo, the female bamboo, which is seldom more than an inch and a half in diameter, and the solid or male bamboo, which is perhaps a trifle thicker than the above. This year all three kinds have flowered far and wide. In addition to these true bamboos, we have a bastard bamboo, called the nig-aulee ; this is seldom more than three-quarters of an inch in diameter, and from 12 to 16 feet in height. It is very hardy, bears intense cold, grows luxuriantly on the crest of the Nagkunda Pass, as also on Huttoo, and on a spur of the Shaitool Pass, height 9,500 feet. It is a very graceful variety of the bamboo, and is a great ornament to the flower garden. I will write up and ascertain if this too has flowered.”

3. From the Secretary Local Committee, Public Instruction, Baraset, enclosing the following extract from the Annual Report of the Baraset Government School :—

“ The boys read *Chambers' Vegetable Physiology*, which has been made a part of the scholarship course, and cultivated separate pieces of ground, as in the last year. Three of them have been deemed deserving of prizes, to be given out of the proceeds of the sale of produce.

“ It has been proposed to invite sons of the agricultural people, say ten in number, by pecuniary inducements to work in the garden with the mallis, and to receive lessons in the elements of the Bengali language, so as to be able to read easy books on agriculture in that language. The pundit of the school is willing to give the necessary instruction at his leisure hours, on receiving a small remuneration. Owing to various circumstances, the proposition has not been carried into effect. The expense requisite for this purpose can be paid out of the surplus funds of the garden.

“ The following presents of seeds have been received from the Agricultural and Horticultural Society of Calcutta : seeds of trees and shrubs 64 sorts, Cape vegetable seeds 32 sorts, and cereals of sorts, and seeds of field crops 16

sorts. The seeds of trees and shrubs having been received in June, I had the pleasure of personally watching their progress through the various stages of growth, and am happy to find at this moment, that most of those young plants which were transplanted under my own direction, have attained to full vigor. The vegetable seeds and some of the cereals I could see sown; but of their subsequent development I know nothing, having been at that time transferred from Baraset; but I have been told, and feel pretty certain, that the vegetables grew tolerably well, but that the cereals did not germinate even."

4. From Dr. E. Balfour, Madras, presenting two copies of his *Cyclopædia*, and returning thanks for certain publications of the Society.

5. From Dr. Alexander Gibson, Superintendent Botanic Gardens, Bombay, mentioning in reply to an enquiry that he does not possess the Cape thatching grass (*Restio tectorum*.) "The only foreign grass I had for some time," adds Dr. Gibson, "was the tussack of the Falkland Islands, and this soon found the place too hot to hold it, and died off."

6. From J. Cowell, Esq., tendering his resignation of the various Committees to which he belongs, in consequence of his approaching departure from India.

7. From R. B. Chapman, Esq., Under-Secretary Government of India, enclosing copy of a letter from Monsr. Laget, of the Department of Gard (France), expressive of his desire to open a communication with some residents in India, for the supply of Indian silk-worm eggs for trial in India.

Resolved—That an abstract of this letter be entered in the proceedings for the information of those interested in the subject.

8. From Signor F. Lotteri, alludes to the prizes offered in former years by the Society for unwinding the eri silk cocoon; states that he has been successful in Europe, as the letters and pamphlets accompanying his letter will show; and that it should form a part of the instruction to be given in the school which he suggested the Society in his former letter to establish.

Resolved—That it be suggested to Signor Lotteri to communicate with the Industrial Arts Society, the subject of his former letter coming more within their province than of this Society.

9. From J. H. Allen, Esq., Manager N. W. Dāk-Company, intimating his readiness, with reference to the communication from the Commissioner of Oude, read at the last meeting, to send, free of cost, to Cawnpore, boxes of seeds for the soldiers' gardens at Lucknow, to the extent of 100 maunds.

Resolved—That the best acknowledgments of the Society be given to Mr. Allen for his most liberal offer, which the Secretary stated he had lost no time in accepting.

10. From R. Montgomery, Esq., tendering his best thanks to the Society for the liberal supply of seeds furnished him, and to the Agent N. W. Dāk

Company, for sending them, free of all cost. Mr. Montgomery adds that the boxes had reached him in a very short period.

11. From the Deputy Quarter Master General of the Army, requesting the transmission to the officer commanding at Benares, for the use of the troops at that station, of a good supply of vegetable and flower seeds.

The Secretary announced that no time had been lost in meeting this application.

12. From C. E. Chapman, Magistrate of Dinagepore, requesting a supply of vegetable seeds for the use of the Naval Brigade (100 men) at that station.

Ordered—That this application be met to the best of the Society's ability.

13. From Mr. J. Templeman, seedsman, Cape of Good Hope, advising despatch of a trial assortment of vegetable seeds.

14. From Messrs. Villet and Son, intimating the despatch, per *Gipsy Bride*, of the Society's annual consignment of vegetable seeds.

The Secretary mentioned that the letter of advice was sent by the *Defiance*, which did not leave for nearly a month after the *Gipsy Bride*, and as, moreover, the seedsmen had not addressed the cases properly, they did not reach the Society's rooms till three weeks after the arrival of the latter vessel.

Resolved—That Messrs. Villet be apprised of their carelessness, and be cautioned to adopt measures to prevent a repetition of such culpable neglect of the interests of the Society.

For all the above donations and communications the best thanks of the Society were accorded.

(Monday, the 4th October 1858.)

Baboo Peary Chand Mittra, Vice-President, in the chair.

The minutes of the last General Meeting were read and confirmed; and the following gentlemen, proposed on that occasion, were elected members:—

Lieutenant T. F. O. Scott, Captain R. C. Birch, Major H. W. Blake; Messrs. G. F. Kelner, G. F. Lord, J. B. Roberts, J. W. H. Ilberry, R. A. Wood, and C. H. Barnes; Drs. B. Kendall, and James Allan; Messrs. H. T. Prinsep, Hartley Watson, C. Paterson, and R. S. Moncrieff.

The names of the following gentlemen were submitted as candidates for election:—

Hugh Leonard, Esq., C. E., Superintendent of the Mutla,—proposed by Mr. J. F. Galiffe, seconded by the Secretary.

Colonel C. J. B. Riddell, C. B., Royal Artillery, Benares,—proposed by Sir Arthur Buller, seconded by Dr. A. H. Cheek.

W. U. Eddis, Esq., Hizlabut Factory, Pubna,—proposed by Mr. H. G. French, seconded by Mr. G. R. French.

Lieutenant Malcohn G. Clerk, (D. P. W.,) Lucknow,—proposed by Mr. C. A. Cantor, seconded by the Secretary.

George Macleod, Esq., Rajapore Factory, Rajshaye,—proposed by Bahoo Peary Chand Mittra, seconded by Mr. W. G. Rose.

John Ogilvie Hay, Esq., Merchant, Akyab,—proposed by Mr. D. B. Lindsay, seconded by Mr. W. Stalkartt.

Joseph Graham, Esq., Barrister at Law,—proposed by Mr. Longueville Clarke, seconded by Mr. W. G. Rose.

The following contributions were announced :—

1. A pamphlet, entitled “The Port of Calcutta and the Port of Mutla, considered in connection by a railway or ship canal.” Presented by S. H. Robinson, Esq.

2. Selections No. 2, from the public correspondence, &c., of the British Indian Association. Presented by the Association.

3. Twenty barrels of New Orleans cotton Seed. Presented by the Cotton Supply Association of Manchester.

It was resolved that this seed be advertised for distribution among members and the public generally, on the terms proposed in the letter of the Association, which was submitted at the July Meeting, namely, that the recipients undertake to furnish reports of the result of their sowings.

4. Three kinds of seeds from Upper Assam. Presented by Captain W. H. Lowther.

The following is extract of Captain Lowther's letter, descriptive of these seeds :—

“I send you by letter dāk, so as to reach you for this season's sowing, sundry seeds :—1st.—Seeds of a promising ‘Cissus,’ or wild vine—a jungle in these parts, and bearing a great abundance of capital racemes of sub-acid berries—*grapes* in fact in their pristine and savage luxuriance. I believe Major Smith attempted wine from them, but only succeeded in obtaining vinegar: there can, however, be no doubt that, in the hands of some experienced manufacturer, they would produce a good and cheap claret in the mild temperature (70°) of Suddyah. Also this hardy plant would, no doubt, furnish excellent stocks for the grape vine, which, in our moist climate, will not bear fruit, but runs to wood and leaf. The local name of this climber is ‘*Lutta Paniyal*,’ and the fruit is much sought after by the omnivorous Assamese.

“2nd.—Seeds of ‘*Flacourtia cataphracta*,’ *Paniyal* of Assam. A small tree, thorny, and bearing abundantly a very pleasant sub-acid kind of plum, much hunted after by the natives; to judge by the flavor it would make

excellent jam or chutnee,—however, you may possibly possess both this and the next described fruit, and I therefore enclose a very small amount of seeds pending that information.

“3rd.—‘*Pierardia sapida*,’ or *Lutkoo*, in my opinion, ranks next to its delicious congener, the ‘litchi,’ for which it would, no doubt, furnish famous stocks, being of large growth, and very full of sap. In our jungles the tree attains an immense size: the fruits load the branches almost to their destruction, and attain a perfection which, under culture, promises to render it an esteemed dainty. It is occasionally met with in gardens and enclosures, but seems to prefer the rank moisture and shade of the indigenous woodlands, in company with *Garcinia pedunculata*, *Dillenia speciosa*, and other shade-loving vegetation.

“The *Lutkoo* is sold during the season in all our markets, and appears to be in great request among the laboring classes as a quencher of thirst.

“4th.—I have obtained a true specific for ring-worm, among the very numerous family of *Ruellidæ*, with which every part of Assam appears to swarm. The local name is ‘*Khar-mar*,’ literally *ring-worm killer*, and indeed it richly deserves the appellation, to judge by its immediate effects in old cases of years’ duration, where the patients were covered with that troublesome eruption from head to foot. The mode of application is this:—A sliced lemon, or the bruised point of a thorny ‘*Solamun*,’ is first well rubbed on the affected parts, until irritation is produced, then a handful of the *Khar-mar* leaves, slightly bruised, and applied with sufficient force to cause pain, and produce friction: a quantity of black juice (evidently a *dye*, and having the smell of indigo) exudes from them, and appears, by its penetrating astringency, to arrest the progress of the skin disease. I have not yet seen the flower or seed-vessel of this *Ruellia*, but shall send you plants when I have an opportunity.”

5. Specimen of wild paddy from the vicinity of Tumlook. Presented by W. Terry, Esq.

Mr. Terry writes that this wild paddy grows in any quantity in marshy salt-water land near to Tumlook.

6. Specimen of stick lac from Cuttack, gathered on the *koosum* tree (*Schleichera trijuga*). Presented by J. L. Atkinson, Esq.

7. A small sample of cotton raised in his grant in the Soonderbunds from Sea Island seed. Presented by Baboo Gyanendramohun Tagore. This cotton is considered of pretty fair quality, though not equal to the samples recently submitted to the Society, which have been raised in the same locality from the same description of seed.

The motion, of which notice was given at the last Meeting by Baboo Peary Chand Mittra, that a silver medal be awarded to Jaffer Ali, of Deenanuggur,

with a suitable inscription in Persian, for his successful efforts at cultivating silk in that locality, was brought forward, seconded by Mr. W. G. Rose, and carried unanimously.

Nursery Garden.

The Gardener's monthly report was submitted, of which the following are extracts :—

"In submitting my report for the past month, I beg to state that I received two kinds of American cotton seeds from Messrs. D. Landreth and Sons of Philadelphia, *viz.*, the Sea Island cotton and Petti-Gulf cotton, and they were as usual sown in trial gunlows; and the result, I am happy to communicate, is very satisfactory, the former yielding cent. per cent., and the latter 70 per cent., and that both had freely germinated within 48 hours.

"The Cape seeds from Mr. J. Upjohn, of the Cape of Good Hope, being recently received, I have had only time to sow them for trial, the result I shall have pleasure in communicating at a future date, but I may state that the packet contains 39 kinds of good vegetable seeds, and which I consider to be well assorted, and forms a very good collection, much better than that of Messrs. Villet and Sons, or Mr. Templeman.

"The few country vegetable seeds received from Mr. C. Blechynden, I consider to be of good kind and deserving of attention, and for which reason I have laid them out in the open ground in the kitchen garden. I have every reason to hope the seeds will freely germinate, and as to the tubers some have already begun to sprout out.

"In the orchard I have a large collection of the Chinese green dye plants available for members, and I may say that the present season offers the most favorable opportunity to lay out these plants where they are intended to be cultivated. The spot to be selected must be only free from heavy damp, such as any place in which water may be lodged at any considerable time, say about 36 hours or above. The plants make a healthy and vigorous growth after they are pruned or headed at the usual season of the year, and which, I perceive, has been the case with those in the garden since heading them.

"The rutmeg and mangosteen plants, received from Mr. Antony of Penang, in October last, and in health, are now in the best condition imaginable: a few I had planted out in open ground in the orchard among the mango trees, and I may say, much contrary to my expectation and to my very great surprize, I find them thriving in a vigorous state of health. I make these remarks particularly, as in my former trials I had not only failed to succeed in rearing them, but such as were put in the open ground had all, after a short period of duration, withered off. All the coffee

plants, with indeed, a few exceptions, laid out in the mango plots, are doing well.

"I have now added to the ready stock a large collection of 19 kinds of peaches, all kinds of mangoes and pummelows, the two kinds of eugenias; also custard apple, liches, guavas, a few cherries, wampie, and assorted limes, lemons, and a few mandarine oranges, with Noakolly and other kinds, and also all the varieties of pine-apples; and about 200 young runners from the small stock of the strawberry, which are now in a most healthy state, and ready for distribution to any members in want of them. A list of the members, whose names are registered, will be soon forwarded, with a view that they may be informed of the same.

"In the Kitchen Garden, besides the preparation of beds for laying out all kinds of vegetable seeds for the ensuing season, I beg to state that I have prepared a small spot in laying out the maize seeds received from America from Messrs. D. Landreth and Sons—which being the present year's importation, with a view to raise a few acclimated seeds of the same, which are of 9 kinds—and of each 200 seeds have been put into the ground. The result, I am glad to state, fully bears out the report submitted in the trial sowing, and that all the seeds have freely germinated, and yielded a return fully bearing out my trial reports. The only seed failed is the Stowell's evergreen sugar-corn.

"The cotton plants laid out in different plots are doing as well as can be expected; those from the seeds of Mr. Blundell's imported Sea Island cotton and of Mr. J. M. Hall's Egyptian cotton seeds, sown next to the Conservatory, have attained a height of 7 and 8 feet, and are now getting into full blossom. The Petti-Gulf cotton seeds received last year from America have likewise made a good growth, and are in bloom.

"The fibre-yielding plant, called the *Papeng Shaw*, has attained this year the height of nearly 4 and 5 feet, with fine healthy broad leaves, which speaks much of the plant running into vigor, and I hope I shall be able to extract a large quantity of its fibre in due time to enable the same to be properly tested.

"In the Flower Garden I have much pleasure in stating that the repairs of the Conservatory are completely finished, and I have removed there all my tender habit plants, where they have now started up in vigor, though I regret to say that, owing to the want of such protection during the past season's heavy rains, have caused me to lose many of my fine healthy plants of carnation and picoties; the few now remaining are doing well. The *Hoya* plant, presented by Rajah Nursingchunder Roy, in March last, has now come into flower, which is indeed of a very pretty description. The *Mussanda speciosa*, received from Mr. S. P. Griffiths, being one of the batch of the Java plants, is now flowering; this also bears a very pretty flower.

"I now beg to send three kinds of fibres, as specimens, to be laid before the committee; the first is No. 1, a trial experiment of fibre extracted from pine-apple leaf. This is my first experiment in it. The fibre appears to me to be rather coarse. The second is No. 2, from the *Agave lurida*; this is likewise my first experiment in it. I consider the fibre to be good and of good length, but rather coarse, taking more towards hemp or flax than that for jute and such like fibres. The third is Jubbulpore hemp (*Crotalaria tenuifolia*), which is also my first experiment, but I consider this fibre to be much inferior to that usually produced in its native place, and the strength and durability I also consider much inferior, though this might be improved if another experiment were made.

"The pine-apple fibre I have succeeded in extracting, after having pressed the leaves under a roller to extract the sap it contained, and then to steep the same for nearly a week in water, and then to take off the refuse gently with fore-finger and thumb, and afterwards to wash them properly in clean water to separate any refuse that might have adhered to it. The process for the *Agave lurida* was nearly the same, and the Jubbulpore hemp was, after stripping the bark from the stock, taken from the lowest end. To none of which I allow the process of fermentation, and therefore can't say what and how the result would turn under that process. I also send two stems of *Aralia papyrifera* (*China rice paper plant*), having dried and varnished them with the view that they may be laid before the committee, and added to the collection in the museum."

Artificial Irrigation on Cotton Crops.

Read a letter from the Government of India, with its enclosure, a summary of papers on the subject of the effect of artificial irrigation on cotton crops.

Suggestions for Agricultural Improvements.

Read the following letter from Baboo Puddunlochan Mundul, Zemindar at Balasore :—

"To the Secretary of the Agricultural and Horticultural Society.

"SIR,—I beg to draw your attention to the following points regarding the system of agriculture, that being followed out, will, in my humble opinion, lead to the progress and prosperity of that most useful art.

"1st.—That the Society is very diligent to promote the agricultural labor and produce of our land: but its diligence is not so directed as to have a result equal to reward, or rather to recompense, the labor and expense undergone.

"2nd.—That, for this reason, the Society may look after those districts where such a recompense is more probable than in other districts; and that

in the former the Society should not only establish a regular system of agriculture, but also encourage it as much as it lies in its power.

“3rd.—That the Society should enquire into the necessity of particular agricultural products in particular districts, and should, accordingly, deal out lands for the raising of them.

“4th.—That in every district the agricultural art should be made to practise, and be encouraged in proportion to the consumption therein of the products; and that rewards be given from time to time in order to attract the laboring class to the pursuit of the art.

“5th.—That, for an illustration, the Society is referred to the district of Balasore. The major portion of its soil is rich and productive. The demand there of the tobacco, the potato, the cotton, the flax, the hemp, the sugar-cane, &c., being very high, these articles are imported from other places; the flax, the hemp, and sugar-cane are indeed raised there with much difficulty and little success.

“Lastly.—That it is desirable that the laboring class of every district of such description should be versed with the principles of agriculture; and that the landholders of that district may readily co-operate with the Society by appropriating their land (if needs be of them) to its use, and by offering pecuniary contributions to the funds that may be raised to execute its grand and noble object.

“Calcutta, 19th September 1858.”

Resolved—On the recommendation of the Council, that the Baboo be informed that the Society are quite willing to co-operate with him in any practicable suggestions he may make in regard to improvements in his district. That they propose that he and the other wealthy and influential Zemindars at Balasore form a Branch Society to co-operate with this Society for the introduction of useful seeds and plants, and for such other purposes as may be suggested, with the view of attaining the desired object.

Communications on various subjects.

The following letters were also submitted:—

1. From Lieutenant R. Stewart, Officiating Superintendent of Cachar, enclosing copy of a programme of a Fair to be held in Cachar next cold season for five days, from the 30th December to 3rd January 1858-59, and applying for seeds of sorts for distribution on the occasion. “The mela has been very widely advertised in Sylhet and Cachar,” writes Lieutenant Stewart, “among the Hill Tribes, and to the east, and there is every reason to believe that it will be largely attended. Would this not form an excellent opportunity for the distribution of seed, both vegetable and corn, among a people who are proverbial for their poverty in the variety of their food?”

"2nd.—Should the Society approve of this proposition, I shall be very glad to undertake the distribution of any quantity that you may send up. Nothing in the way of a vegetable can be amiss, but I would recommend the coarse and larger kind of garden pea, the field pea and bean, different descriptions of doll, gram, large cabbage, field carrots and turnips, potatoes, onions, mangel warzel, raddish, oats, barley, wheat, varieties of rice, mustard seed, linseed, sesamum, flax, hemp, cotton; the seed of native or acclimatized fruit trees, also that of good timber trees, as forming the best assortment that could be sent up.

"3rd.—Prizes are this year to be offered at the mela for the best description of cattle produced for sale: these will comprize elephants, ponies, both Munni-poorie and Burmah, buffaloes, cows, and goats. It might be given out, while distributing these seeds, that next year prizes would be given for the best samples of their products."

Resolved.—That as large a supply of seeds as can be spared be forwarded immediately to Lieutenant Stewart, for the purpose indicated in his letter. .

2. From Captain Thomas Hutton, Superintendent Himalayan Mulberry Plantation, Mussooree, intimating that the Government has sanctioned an experiment with his wild *Bombyx* (*B. Huttoni*;) and applying for eggs of all other kinds of silk-worms, wild and cultivated, that can be procured, for a series of experiments which he is desirous of instituting on silk-spinners generally.

The Secretary intimated that he had lost no time in writing to various correspondents, with the view of giving effect to Captain Hutton's application.

3. From J. L. Atkinson, Esq., Cuttack, expressing his wish to attempt silk cultivation at Cuttack, and asking for information on the subject, and for eggs. Mr. Atkinson observes:—"I am now trying whether by feeding the Tussur worm of this country on white mulberry leaves, and making them spin in paper funnels, will at all improve the Tussur silk. Cocoons of Tussur silk are to be had plentifully here, but more so in Colehan, where they are allowed to grow wild, little or no care being taken of them. The natives here boil the cocoons for twelve hours and wind the silk, causing a great wastage, and useless expenditure of labor, as well as discoloring the silk, making it more yellowish. 525 cocoons, wound in the native system, yield a seer of silk, of 105 tolas, and is sold for rupees 5 only. Is it at all cheap? And will careful feeding and winding at all be worth speculating upon?"

4. From Mr. J. Upjohn, of the Cape of Good Hope, advising despatch of a trial assortment of vegetable seeds. (Received and under trial in the garden.)

5. From Messrs. James Carter and Co., forwarding the Society's annual consignment of flower seeds. (Received and now in course of distribution.)

For all the above communications and presentations the best thanks of the Society were accorded.

(Wednesday, the 10th November 1858.)

The Honorable Sir Arthur Buller, President, in the chair.

The minutes of the last General Meeting were read and confirmed.

The following gentlemen, proposed at the last meeting, were elected members :—

Colonel C. J. B. Riddell, C. B.; Lieutenant Malcolm G. Clerk; Messrs. Hugh Leonard, W. U. Eddis, George Macleod, J. O. Hay and Joseph Graham.

The names of the following gentlemen were submitted as candidates for election :—

Alexander Ross, Esq., C. S., Civil and Sessions Judge of Furruckabad,—proposed by Mr. R. Berkely, seconded by the Secretary.

J. W. Maseyk, Esq., Indigo Planter, Malda,—proposed by Mr. J. J. Gray, seconded by Mr. H. Maseyk.

P. Augier, Esq., Calcutta Mint,—proposed by Mr. A. N. Clarke, seconded by Baboo Hurreemohun Sen.

M. W. Townsend, Esq., of Serampore,—proposed by Mr. M. Wylie, seconded by the Secretary.

A. Maclean, Esq., C. S., Kishnaghur,—proposed by Mr. A. Grote, seconded by Dr. Thomas Thomson.

E. A. Dow, Esq., Solicitor, Supreme Court,—proposed by Mr. Joseph Agabeg, seconded by the Secretary.

Captain H. Raban (36th N. I.), Calcutta,—proposed by Mr. Grote, seconded by Dr. Thomson.

The Secretary for the time being, Artillery, Head Quarter Mess,—proposed by the Secretary, seconded by Mr. C. A. Cantor.

F. Read, Esq., Superintendent of Irrigation, Rohilkund,—proposed by Major General J. T. Lane, C. B., seconded by the Secretary.

C. Connew, Esq., Calcutta,—proposed by Mr. T. H. Bennet, seconded by Mr. W. G. Rose.

T. J. Knox, Esq., Madras Civil Service, Vizagapatam,—proposed by Captain W. Owen, seconded by the Secretary.

G. B. Tayler, Esq., Benares,—proposed by Mr. R. H. Hollingberry, seconded by Mr. Joseph Agabeg.

E. H. O'Brien, Esq., Calcutta,—proposed by Mr. C. A. Cantor, seconded by Mr. W. G. Rose.

Baboo Sonatun Bysack, Calcutta,—proposed by Baboo Peary Chand Mittra, seconded by Baboo Shibchunder Deb.

The following contributions were announced :—

1. General Report on the Administration of the several Presidencies and Provinces of British India during 1856-57, with Maps. Parts I. to III. Presented by the Government of Bengal.

2. A few plants from Rangoon, yielding an elastic gum. Presented by Captain E. H. Power.

These have, unfortunately, reached in a very sickly state.

3. A few excellent specimens of yellow and white maize, from American stock, and an aerial tuber of "New Zealand yam," presented by Mr. C. Sharpe, of the Barrackpore Park.

The following is an extract of Mr. Sharpe's letter on the above specimens :—

"I send a tuber, the produce from a small tuber (a little bigger than a hen's egg), which I received from the late Mr. Piddington in March last, and he stated it to be a New Zealand yam. I planted this small tuber in April last; it made very little growth till the rains set in; in July it was growing very fast. I then had large bamboo branches put up to keep the runners off the ground. In August I was rather surprised to see tubers forming on the runners. This I now send is, I think, the largest of about 10 fallen from the plant—20 more tubers are on the plant, of different sizes, and many more small tubers like peas appearing. Until I saw the tubers growing on the runners 6 to 8 feet from the ground, I was only thinking about a crop of tubers at the roots. I have also put up 20 cones of American corn seed from your American seeds of 1857—sown here in December and reaped in March 1858—sown again in June, and this is part of the produce. I will sow this year's seeds in the same routine."

4. A sample of raw silk of a superior quality, from the tussur worm of the Punjaub. Presented by H. Cope, Esq.

The following is Mr. Cope's note on the subject :—

"I am very glad to hear that the tussur is so much approved of. I do not think, after a very careful comparison with Mr. Frith's description of the *Saturnia* and all he says about that beautiful moth, that there is the slightest difference between the insect of Bengal and of the Punjaub. But the worms feed up here on the common 'ber,' and not on the 'asun,' as with you. Lord Wm. Hay has been so good as to send me several seers, and I will have them wound here, and send you large samples. The worm is found both in the plains near the hills, and on the lower hills wherever the 'ber' tree thrives; but not in sufficient quantities to make them an object of commerce, until they shall be cared for in the same way as in Bengal, as the numerous enemies they have greatly diminish their number."

5. A specimen of a hard and fine-grained wood from the Sonthal district. Presented by E. Johnson, Esq., of Narcoolbarea ; accompanied by the following communication :—

“ Having observed amongst the *Proceedings of the Society* a premium offered to the discoverer of any wood indigenous in India, and procurable in sufficient quantity, which shall serve as an efficient substitute for Turkish box, especially for wood-engraving, I beg to send herewith a specimen of wood, which I believe to be such as is required. It is called by the Sonthals ‘*parpurool*,’ and by the other natives in the district ‘*parpuree*.’ It bears a large leaf, two or three of which joined together form a dish for rice, &c., used by the Sonthals—the fruit is also eaten by this race. The wood is brought from ‘*Cheetowleea Hill*,’ 5 to 6 miles south-west of ‘*Byreoo Thannah*,’ which is 16 to 18 miles to the west of Rajmahal, in the Sonthal district.

“ A fair, called ‘*Bahlahsundee Hât*,’ about 6 to 8 miles north-west of Rajmahal, is held every four days, to which the Sonthals bring large quantities of different sorts of wood for sale, and say that they can bring the ‘*parpurool*’ always, if ordered one hât previously.

“ The man I sent to explore counted some 4 or 5 ‘*parpurool*’ trees within 3 to 4 miles, following the small hill paths ; but the Sonthals, who accompanied him, said that in the jungle (where they only can penetrate) they can procure a large quantity if required. The circumference of the sample now sent is 16 inches ; and two of the trees seen by my man were 40 inches in circumference according to the measure he brought, and which I quite believe to be correct. The other two to three trees seen by him were about the same size as the sample now sent.

“ The Sonthals make combs for the hair from this wood.

“ With the sample I have sent two specimens turned from a piece cut off one end for the purpose, and which will show the close grain of the wood—it appears also to be very hard.”

Mr. Johnson has promised to send specimens of the flower and fruit of the tree yielding this fine wood during the next hot season.

Nursery Garden.

The Gardeners’ monthly report was read, of which the following are extracts :—

“ In continuation of the last monthly report, I beg to state that I received a glazed case of plants, *viz.*, India rubber plants, from Captain Power of Rangoon. There were five plants, or rather five branches, which had slightly taken root, before being placed in the case; but as the whole were placed in a compost consisting principally of house rubbish, the whole dried up very speedily, and for want of moisture the plants suffered very much ; however, on

its receipt I immediately made cuttings of all, but I fear I shall not be successful with them.

"In September last I received two packets of seeds of 9 kinds, presented by Captain Lowther of Assam. The whole were laid out in the usual way: of the entire batch the following only germinated:—*Passiflora edulis*, very freely; seeds of *Cissus-Sps.*, very freely; and that of which Captain Lowther states to be a specific for ring-worms; this plant is now too young to be traced out, but as soon as this is done, I shall not fail to communicate the same.

"The 39 kinds of trial vegetable seeds received from the Cape of Good Hope, from Mr. Upjohn, are really very good, and I consider both the collection and seeds to be far superior to that of Mr. Templeman, and much better than that of Messrs. Villet and Sons. The entire batch have freely germinated, excepting the two following kinds—the drumhead cabbage and sage, and the average percentage it yielded (67) is more satisfactory than the result shown in the other two, as will be perceived from the accompanying tabular statement. The whole of the seeds were also laid out in the open ground in the kitchen garden, a few days previous to the fall of the last heavy rains of the 25th ultimo, when they equally had freely germinated as in the trial sowing, but I regret to add that the whole had seriously suffered from the severe rains, in consequence of the places being overflowed by the rains. The specimen peas belonging to this batch were also laid out in open ground, but in somewhat elevated position; such as had germinated before the rains have withstood all injury and are now doing well, those which were just developing have, unfortunately, been injured by being damped off. I may state that, much to my great surprise, I found the dwarf eclipse, and bishop's dwarf, imperial blue, and perfection peas to have freely germinated, and I expect their issue will be a satisfactory result. Had not the sad accident taken place so unexpectedly, I had every reason to hope the result would fully bear out the trial sowing. The specimen being a special one, I had carefully attended to its trial sowing, and must say that the batch far exceeds in selection and quality the others I have received during the present season; but, I think, to establish such an opinion finally, it would be necessary to get seeds for two or three seasons more before such a decided opinion can be given, as I consider that this batch might have had some especial care and attention to its packing and despatch.

"The 12 new varieties of vegetable seeds received from Messrs. Gibbs and Co., and sent for special trial, had met my usual attention; but I regret to state that, though I made two special sowings of the whole, they have somewhat singularly failed to germinate—even the *Sorghum saccharatum*, which is indigenous to this country; whereas the seeds of the latter cereal, presented by General Sir John Hearsey, have not only freely

germinated, but have now grown upwards of 14 feet high, and are full of grain.

"The English flower seeds for the present season, from Messrs. J. Carter and Co. of London, are equally as good as that of the past year; though some are a little different, yet others exceed the average percentage sowing of the past year; consequently the whole may be said to be equally good. The accompanying tabular statement will show the result of the whole, which I consider to be very satisfactory.

"The Virginia tobacco seeds, presented by Mr. W. G. Rose, was laid out in gunlows, and in open ground. The seeds in gunlows have not yet germinated satisfactorily, but those in the open ground have yielded a better result, though the same had slightly sustained some injury from the last heavy fall of rains, as the seeds were sown a few days previous to the rains. The Kareen tobacco seeds, received from Dr. Thomson of the Botanical Gardens, presented by Captain Houghton, as the seeds collected from the Kareen Country, during the last year, was likewise laid out in open ground and at the same time, and I am happy to find the result to be very satisfactory.

"The general work done in the garden in the re-arrangement of all plants in the conservatory, dressing up the flower garden and securing every available spot to lay out seeds of annual flowers, and also in laying out the Kitchen Garden, each had a share of due attention, and the work was progressing satisfactorily as time and circumstance would admit; but, unfortunately, the disaster caused by the late gale, and the heavy fall of rain for a consecutive period of 36 hours and upwards, have tended to overthrow all the work previously done. Of the destruction and other damages caused by this disaster I beg to submit a statement in the accompanying memo.

"The cotton plants in the three plots have attained a very healthy growth during the past season. Many plants have attained to an extraordinary height, and formed complete bushes. I have much pleasure in submitting a rough statement of the produce of the plants of the three plots for the past season.

"In conclusion I beg to state that I have added to the ready stock, from the present year's produce, a large number of grafts of mangoes, peaches, litches, rose and star apple, pomegranates, spondias and a few cherries, and about a dozen cuttings of raspberry, fifty cuttings of gooseberry, and two hundred suckers of strawberry plants. All are available to members and non-members, at the usual rate of charges.

"In the Flower Garden a large collection of all kinds of roses, and a few of the Mauritius roses; forty-two fine healthy plants of *Amherstia nobilis*, seventy-two fine healthy plants of mahogany, from two years and upwards, and some of the satin-wood tree of the same age; a few *Fraxinus*, or

Chinese wax-yielding plant, and a variety of useful and ornamental plants are ready for distribution.

"The *Ceratonia siliqua*, or the carob trees, have this year, for the first time, come into bloom, which they have done profusely; but have not swelled into fruit as yet in any one of the spikes. The Nepal pear trees have likewise bloomed for the first time, and the *Daphne*, named after Mr. Fortune, presented by that gentleman in 1854, has now bloomed; the flowers of the same are exceedingly beautiful."

In connection with the above, the Secretary submitted statements of trial sowings made by Mr. Sharpe at the Barrackpore Park, of the Society's annual consignments of American and Cape vegetable, showing a general average percentage of 58 of the former and of 45 of the latter. Mr. Sharpe remarks:—"My opinion of the seeds is that they are very good. Some have failed altogether in my trials: light seeds that do not germinate quickly are apt to be carried off by ants, and other mishaps may occur."

Communications on various subjects.

The following papers were also submitted:—

1. From Dr. Campbell, Superintendent of Darjeeling, enclosing extract from his Report to the Board of Revenue regarding the progress of tea cultivation at Darjeeling. (Referred to the Committee of Papers.)

2. From H. G. Keene, Esq., in continuation of a previous notice about some of the vegetable productions of the Deyrah valley:—

"In reference to your inquiries about the coffee," writes Mr. Keene, "I beg to state, for the information of the Society, that I am now engaged in the publication of a pamphlet on the Doon as a scene of English colonization, which will go somewhat elaborately into the agricultural capabilities of the district; and will, I trust, form a useful manual on the subject. In the meanwhile I may observe that the coffee, of which I sent you a specimen (which answered so badly owing to bad packing), was grown by Lalla Mohur Singh, my treasurer, from seed given to him by Mr. Vansittart about A. D. 1845: other landholders received seed at the same time, but did not take the trouble to sow it, and Mohur Singh's labors ended with that operation. The coffee, sown in the untidy garden so universally met with in these Provinces, grew untended, but in one respect benefited; I mean that the damp and shade of the surrounding plantains and mangoes have favored its growth. He is now propagating it by slips, and promises to turn his attention to the subject in earnest.

"The other valuable produce of the Doon is tea, which yields as much as 300 lbs. of manufactured tea per acre. It has to be shaded by straw blinds and freely sprinkled with water during the hot weather, and the seedlings are planted out when about nine months old."

"It is believed that Indigo would grow to a profit. Cereals are decidedly unsuccessful. A peculiarity of this valley is that there is no frost (in most parts) in winter, and but little hot wind in summer. These remarks apply least to the open ground of the Western Doon, and most to the sheltered neighborhood of Deyrah.

"When my pamphlet appears, you will find little else required, I hope, for practical purposes. The cassia is from the Hill Pergunnah of Jouniar Bawur, which is rich in ginger, chillies, turmeric, walnuts, potatoes, opium, wax and honey."

3. From Lieutenant J. F. Pogson, in reference to the proposed establishment of agricultural schools:—

"I am glad to see there is some chance of establishing agricultural schools—when this is done education will prosper. The system I would recommend would be lectures in the Vernacular, given at large villages, and all the interesting experiments contained in *Johnstone's Catechism of Agricultural Chemistry and Geology* being shown to the audience. The native of India is as curious as he is superstitious, and the only way to educate him is to arouse his curiosity.

"The chemical experiments contained in the work alluded to are sure to do this, and when oral education has made some impression on them, it would then be time enough to begin with reading and writing. The latter to be simply the written names of fruits, vegetables and cereals, which the student should be able to read: this much knowledge acquired, other books should be placed within his reach. If any of the Calcutta book-sellers have the work in question, I would respectfully beg all who take an interest in native education to obtain and peruse it."

4. From H. Cope, Esq., the following remarks in reference to the Cape thatching grass:—

"I see by the record of the Proceedings of the Society at their last meeting, that Dr. A. Gibson informs you he does not possess the Cape thatching grass (*RESTIO tectorum*.) I must, in justification of my former letter on this subject, request you to turn, if you have it, to *Graham's Catalogue of Bombay Plants*, where you will find it stated, at page 231, on the authority of Dr. Lush, who was, I believe, Dr. Gibson's predecessor in the superintendence of the Dapooree garden, that the *R. tectorum* was introduced into that garden from the Cape of Good Hope; and it was this assertion that induced me to draw your attention to the matter. Dr. Voigt (*Hort. Suburbanus Calc.*, p. 730,) has curiously mis-quoted the passage in *Graham's Book*. Dr. Lush says:—'Introduced in Dapooree from the C. G. H., where it is much used for thatching houses.' Dr. Voigt makes him say:—'Introduced in Dapooree, where it is much used in thatching houses.'"

5. From P. Cosserat, Esq., of Ghuzeeppore, regarding his sowings of vegetable seeds this season :—

“ Both the American and Cape seeds have germinated splendidly : no failures, and all but Cape parsnip a good average. American parsnip has never failed me whenever I have had it to sow, and in Shahabad I have raised as fine roots as I have seen in England, and fine flavor.”

6. From Lieutenant R. Stewart, Superintendent of Cachar, dated 6th October, acknowledging receipt of a large supply of seeds sent by the Society for distribution :—

“ I have within the last week,” writes Mr. Stewart, “ received the different seeds you so kindly sent me, and I can assure you their distribution has been a great success. The people in this part of the country, in consequence of the failure last year, of their staple—rice—have become in a measure convinced of the benefits arising from a greater variety of cultivation ; and I had not advertised for two days that I had seed to distribute, before my verandah was crowded with applicants. To each of these, having due reference to their places of residence, so as to scatter the seed as much as possible over the whole country, I gave about half a pound of wheat and oats, and a proper portion of the other things. I desired them to report to me of the success or otherwise of the experiment they were going to make, and cautioned them not to consume any of the crop, but to keep it for next year’s seed. I shall be able to make a further report to you by-and-bye, as I shall see many of the places sown with this seed during my cold weather circuit, and, with the experience I shall then have, I will write to you for a further supply for next year.”

7. From Major W. H. Hopkins, commanding at Darjeeling, returning thanks for seeds supplied for soldiers’ garden at that station.

8. From C. E. Chapman, Esq., Magistrate of Dinagepore, conveying his thanks for seeds supplied for the use of the Naval Brigade at that Station.

9. From Dr. J. P. Walker, Superintendent of Port Blair, Andamans, acknowledging receipt of a large box of seeds forwarded to him :—“ The seeds arrived in excellent order. I beg that you will express my thanks to the Society for its kind attention, which is duly appreciated.”

10. From Lieutenant T. G. Ross, Officiating Honorary Secretary Mela Committee, Cachar, enclosing a list of prizes offered at the Cachar Mela, and requesting the co-operation of the Society.

The Council propose that the Society continue forwarding seeds for distribution, but they are not prepared to recommend a money grant.

11. From R. Fortune, Esq., Shanghai, dated 25th August, intimating that he will have great pleasure in complying with the wish of the Society for seeds and plants from China.

Letters were also submitted from the Superintendent of the P. and O. Company, Messrs. Jardine, Skinner and Co., Apcar and Co., and Gladstone, Wylie and Co., expressive of their readiness to have cases of plants and boxes of seeds from Mr. Fortune forwarded free of freight. Messrs. Gladstone, Wylie and Co. add,—“ We may further mention that we shall always be happy to forward the views of the Society in any way they may point out.”

For all the above communications and presentations the best thanks of the Society were accorded.

The ordinary business having terminated, the meeting was made *special*, as notified a month previously, “ for the purpose of considering the propriety or otherwise of continuing the Society’s official connection with the Agricultural and Horticultural department of *The Indian Field*.”

The Secretary, by desire of the President, read the following Resolution, adopted at a meeting of the Council, held on the 9th October 1858 :—

“ The Council, having had under their consideration the connection of the Agricultural and Horticultural Society with *The Indian Field*, are of opinion that it is undesirable that their name should continue officially connected with any publication not entirely under their control, however distinct the different departments may be kept, and however unobjectionable the Society’s part may hitherto have been found ; and therefore *resolve* that the Society be recommended to discontinue the connection.”

Mr. Hume addressed the meeting against the above recommendation.

The President read the following letter to his address from Mr. James Forlong of Kishnagur :—

“ *Neechindipore, November 4, 1858.*

“ TO SIR ARTHUR BULLER,

“ *President of the Agri.-Horticultural Society, Calcutta.*

“ DEAR SIR,—I am very sorry it will not be in my power to attend the meeting of the Society specially convened for the 10th instant.

“ I regret this the more because the subjects to be brought before the meeting have arisen from matters supposed to relate solely to the indigo planting interest, and such being the case, it would only be respectful to you and to the members of the Society generally, that as many planters should attend the meeting as possible.

“ I suppose the questions to be brought under the consideration of the meeting will be confined to two :—

“ *First*.—The correspondence between Mr. McArthur and the Secretary.

“ *Second*.—The disconnection of the Society from *The Indian Field* as its organ.

"As to the first, I hope it will involve little discussion, for in this large indigo district I have not heard one dissentient voice, as to the tone of Mr. McArthur's letters to the Secretary having been uncalled for, and most unnecessarily uncourteous.

"The second subject will, I fear, find the meeting equally unanimous, and my only cause of fear is that, by the course which has been adopted, it will give the parties editing the *Field* some little show of reason for stating that the hostility of the planters had arisen from an honest and independent expression of opinion adverse to them as a body, and almost look like an attempt to interfere with the press; now I can only say, for many other planters as well as myself, that this is far from our feeling regarding *The Indian Field*: we think the articles in the *Field* relating to indigo planting carried with them their own antidote from the strong party animus they displayed, and it seems to us only a pity that a degree of importance should have been attached to them, which they were very far from meriting, by the mode in which some members of our Society have acted; I feel assured that, a quiet and temperate representation to yourself and the Council of the Society, on the part of one or two members, would have obtained all that the meeting proposed for the 10th is likely to accomplish, and that also in a much more dignified form.

"I think at the same time that *The Indian Field* is by no means entitled to be the organ of the Society—simply from the strong Anti-English spirit which it almost invariably displays, and which, without the slightest reference to indigo planting, would assuredly ere long lead even the most moderate members of our Society to exclaim against the Society being represented by such a paper; for this reason alone I record my vote against the *Field* being looked upon further as the organ of the Society, or indeed any other paper at the Presidency: it is idle to expect that any Paper would give general satisfaction, and after the experiment that has been made with the *Field*, it would be unwise to make another of a similar nature.

"In the case of the *Field* every consideration, both public and private, might have dictated to the Editor a spirit of fairness, and have guided his pen impartially in all matters between the European and Native; whereas to the former, particularly unconnected with the services, every opportunity has been seized to exaggerate failings, and in the latter case, to over-estimate virtues, making the paper a vehicle for indulging the prejudiced feeling of the few, in place of what it so easily might have been—a paper not only respected by all moderate men, but useful in healing discord between races in place of creating further irritation; it is this policy alone which has unfitted the paper to be any longer the organ of our Society, and I strongly protest, in the name of many of my brother planters and my own, against our

being thought to be actuated by any other feeling in wishing the connection of the Society with the *Field* to terminate.

“ For planters to combine against any paper for articles merely unfriendly to their own interests, would, indeed, be a silly and undignified exercise of displeasure, and which might well warrant the resentment of the whole press at such interference with its freedom. . .

“ I have noticed, with much regret, the attempts that have been made to prejudice members against our Secretary, whose services have been so valuable, and who, in place of censure, well merits the warmest thanks of every member of our Society ; it is not often that the Secretary is more necessary to his office than the office to him, but it would appear to others and to myself that this is fortunately the case with Mr. Blechynden.

“ I would not have addressed you at such length, did I not feel that it was only just to much the largest portion of the Indigo planters to place their opinions before you prior to the meeting on the 10th, when so few of them, just at this busy time of the season, can be absent from their factories.

“ I have the honor to be,

“ Dear sir,

“ Your most obedient servant,

“ (Signed) JAMES FORLONG.

“ 4th November 1858.”

The President addressed the meeting at some length in support of the recommendation of the Council.

The meeting then divided: when there appeared

In favor of the recommendation	...	...	...	24
Proxies	...	...	...	10
				—34
Against the recommendation	...	...	...	34
Proxies	...	...	...	13
				—47
				—
Majority against	...	...	...	13
				—

The recommendation was accordingly lost.

Since the above meeting was held, a letter has been received from the Board of Management of the Calcutta Printing and Publishing Company, terminating the connection between the Society and *The Indian Field*.

THE JOURNAL
OF THE
Agricultural & Horticultural Society
OF
INDIA.

*The Date Tree; a Prize Essay on its cultivation and the
manufacture of its Juice into Sugar: By S. H. ROBINSON, ESQ.*

(Premium of Five Hundred Rupees.)

SECTION I.

Description of the Tree.

The Palm tribe, to which belongs the subject of this Essay, has been described by the eminent Botanist Lindley as "the most interesting race of plants in the vegetable kingdom, whether we consider the majestic aspect of their towering stems, crowned by a still more gigantic foliage, the character of grandeur which they impress upon the landscape of the countries they inhabit; or their immense value to mankind, as affording food and raiment, and numerous objects of economical importance."

The above remarks are eminently applicable to that portion of the family indigenous to Asia;—and the importance of our Indian varieties could not fail to attract the attention of botanists. The late Dr. Griffith, Superintendent of the Calcutta Botanical Garden, had progressed in a description of the "Palms of India," which has been published since his death, and, though imperfect, is a valuable contribution.

The Date Tree ;

to our knowledge of the subject. He enumerates 18 genera and about 240 species, with illustrations of many of them, and descriptions of many little known and interesting varieties. From this work, and that of his talented predecessor Dr. Roxburgh, may be obtained a fair estimate of the importance and value of our Indian species, and of their useful products. Amongst the principal of these may be reckoned fibre, sugar, oil and sago,—the investigation of each of which would call for a separate Essay ;—but it is evident from what we do know, that the economical uses of our palms are as yet but very imperfectly developed, and are well deserving of further investigation.

It is certain that several varieties yield a valuable sugar besides the Date Palm. It has been made to some extent in Ceylon from *Borassus flabelliformis*, or the Fan palm,—the sap of which is generally used as a ferment by the bread-makers of Bengal ;—and from *Cocos nucifera*, or the Cocoa palm,—to a considerable extent also in Ceylon :—also from *Arenca saccharifera*, an important Manilla palm, which was introduced into Bengal by Dr. Roxburgh,—and from *Caryota urens* common on the Malabar coast, as also in Dinagepore and Assam. At Malabar it yields an extraordinary quantity of sap,—as much as 100 pints in the twenty-four hours in the hot season, as reported to Roxburgh.* It cannot be doubted that many other varieties are sacchariferous, and the two last named certainly merit the attention of the Bengal planter.

Phoenix, the genus to which the Date Palm belongs, comprises nine known species, of which 6 are indigenous in India, and are distinguished as : 1, *acaulis* ; 2, *Ouseleyana* ; 3, *pedunculata* ; 4, *farinifera* ; 5, *sylvestris* or *dactylifera* ; 6, *paludosa*. Of these, No. 4 produces sago of an inferior quality ;—and from all the species the leaves furnish

* Both these last named varieties are still flourishing in the Calcutta Botanical Gardens.

materials for mats or thatch for houses. The sugar yielding variety, *Phœnix sylvestris*, is known as the wild date of Bengal: *Phœnix dactylifera* is the name given to the true Date Palm of Arabia and Africa, but as it appears to be undistinguishable from the Bengal variety, except in size and vigor of growth, there seems little doubt that any apparent difference is due only to superior cultivation and variety of climate or soil; and it being always a cultivated tree in Bengal, the specific name *sylvestris* may have been originally given, owing to its inferiority in size to the African or Arabian tree, with which European botanists were more early familiar.

The Date Palm, when not stunted in its growth by extraction of its juice for sugar, is a very handsome tree, rising in Bengal from 30 to 40 feet in height, with a dense crown of leaves, spreading in a hemispherical form from its summit: these leaves are from 10 to 15 feet long, and composed of numerous leaflets or pinnules about 18 inches long. The trunk is rough, from the adherence of the bases of the falling leaves, which serves to distinguish it at a glance from the smooth-trunked cocoanut palm, which in its leaves only it resembles. Like all of the *Phœnix* genus the trees are diœcious; and the fruit hangs in dense bunches from the centre of the crown of the female tree: it flowers about April or May, and the fruit ripens in July or August; the latter is however of a very inferior description in Bengal, and is seldom gathered except for its seed, from which the young trees are raised. The fruit indeed consists more of seed than of pulp, and altogether is only about one-fourth the size of the Arabian kind brought annually to Calcutta for sale, and when fresh imported, a rich and favorite fruit there. This inferiority of the Bengal fruit may no doubt be attributed to the entire neglect of its improvement there from time immemorial, and perhaps in some measure to the practise of tapping the trees for their sap, so universally,

followed in the districts around Calcutta, its principal range of growth.

SECTION II.

Geography and Statistics.

The Date tree is met with in almost every part of Bengal Proper, but it flourishes most congenially, and is found plentifully, only in the alluvial soils which cover its south-eastern portion, excepting only such tracts as suffer entire submersion annually from the overflow of their rivers, as is common in portions of the Dacca, Mymensing, and Sunderbund districts. The extent of country best suited for its growth, and over which it is found most plentifully as above indicated, may therefore be taken as within an area stretching east and west about 200 miles, and north and south about 100 miles, and comprehending by a rough estimate about 9,000 square miles,—within an irregular triangular space.

The practise of extracting its juice, however, for the production of sugar, extends at present over a much smaller area, probably not more than two-thirds of the above described space; and if we consider further, how small a portion of these favorite date districts even are as yet occupied by date tree cultivation, the room for its future extension, even if confined to these tracts alone, appears a wide one indeed. If we trace an irregular parallelogram, stretching eastward from Kishengunge in the Nuddea district to Backergunge, and from Mahduppore in Furreedpore district southward to the borders of the Sunderbunds, we shall find a space of about 100 miles long by 80 broad, and comprehending the district of Jessore, with portions of Furreedpore, Nuddea, and Burrisaul, to which the product of Date sugar is mainly confined, although the goor,—or the first raw produce made by boiling down the juice,—is found commonly

manufactured for native consumption on the spot, in many localities situated beyond these assumed limits.

Throughout the present Date tract the quantity and quality of the sugar produced vary considerably. The high and dry lands of parts of Kishnaghur and Pubna yield a strong well crystallized product, though less in quantity than from trees of the Jessore and Sunderbunds soils; in which, with a more rapid growth of the tree, a greater flow of sap, and a less rich, though still good and grainy sugar, is produced. The cultivation in these districts is accompanied by a great advantage, in the cheap and abundant supply of fuel for boiling the juice and refining the sugar; and there is probably no part of Bengal where the cultivation may be extended with more profit than in the more elevated lands of the Sunderbund grants.

The production of the date tree sugar—that is, of the dry merchantable product as distinguished from the raw inspissated juice or goor,—has greatly increased in Bengal during the last twenty years, though not to the extent that it would doubtlessly have done, had it not been checked by the violent fluctuations in its value, which will be referred to presently. The following brief sketch of its progress is necessarily imperfect from the great want of reliable statistics on which to frame it. It is certain that previous to the first inroads on the East India Company's trade monopoly in 1813, it was hardly known as an article of export, but was manufactured only to meet the wants of native consumers in and around the few places of its production, principally in Jessore and Furreedpore districts, and for occasional transport to the principal marts of the adjacent districts, and especially to Moorshedabad and Dacca in the days of their prosperity, when, previous to the British rule, they were the centres of the trade and wealth of Lower Bengal. In 1792, it is recorded in an old minute of the Government Board of Trade at Calcutta, that the total

production of, date sugar in Bengal was then estimated at 15,000 maunds of 82lbs each. From 1792 up to 1813—a period of 31 years—the quantity of all sugars imported into Great Britain from the East Indies is found to range from 1,000 to about 6,000 tons per annum, excepting only the year 1801, in which it reached 11,327 tons. In those days all East India sugar was received from Bengal only, excepting an occasional small shipment from Madras.

The modification of the East India Company's trade monopoly in 1813, brought private traders into the field, and we accordingly find the imports of East India sugar into Great Britain gradually ascending from 6,282 tons in 1816 to 13,453 tons in 1822. Throughout this period however, and onward to 1837, all sugars from India were loaded with an additional duty of 10 shillings per cwt., beyond the rate charged on West India sugars; and this appears to have acted as an effective check to the increase of the trade to Great Britain, as the quantity subsequently fell off, and the total Bengal exports thereto from 1830 to 1836 averaged rather below 6,000 tons per annum. This is further shewn by comparing the exports to Great Britain as above with those to other countries, from which it is seen that the former still formed by no means the principal portion of the total quantity exported. North America, the Arabian and Persian Gulphs, and Foreign Europe, figure in the returns as taking off one-third to one-half of the total exports.

We have of course no data to show what proportion of the total exports consisted of date sugars, but the review of these figures affords sufficient evidence of how little encouragement the production of East India sugar generally received for supplying the export trade, and that in fact there was little inducement to extend it beyond meeting the wants of an increasing native population, with whom it has always been a favorite luxury. This increase however, there is little doubt, was most apparent in the sugar from the date tree;

its comparative cheapness, combined with good quality, being sufficient to stimulate its production as an article of domestic consumption in and around the date districts, in preference to the more expensive and precarious cultivation of the sugar-cane. The writer of this treatise first visited the date sugar markets in 1833, and the estimates then made shewed that the production of all qualities was equal to 90,000 maunds of dry sugar. Prices during that and the four following years ranged very low, and it is probable that the year 1837 found the crop of dry date sugar, though a fair average one, hardly exceeding 100,000 maunds.

We now come to a period of great advancement. From 1837 the British legislature decreed the equalization of duties on sugars imported into Great Britain from the East and from the West Indies. The effects of this act of tardy justice on the sugar trade with Bengal were immediate. During the succeeding five years the exports from Calcutta to Great Britain gradually swelled from 13,403 tons in 1836-37 to 63,084 tons in 1840-41. The trade then became a steady one, and onwards to 1847-48—that is, for a period of 8 years—the average of these exports was close upon 60,000 tons per annum.

Here again it must be remarked that there are no reliable data by which to calculate with any certainty what portion of these exports was composed of date produce. Inferential estimates, aided by notes taken by the writer from time to time during this period, shew that in 1848 the total date sugar crop was about 15,000 tons, or 405,000 maunds, of which two-thirds, or 10,000 tons, may have been merged in the exports from Calcutta, the remainder passing away in local native consumption. From this it would appear that the production had more than quadrupled in ten years, and this is probably not far from the truth. Throughout these years high prices were ruling in the British markets, and in Calcutta.

The West-Indies were struggling through their revolution of slave emancipation, and their diminished production of sugar had to be balanced by drawing on the produce of India and Mauritius, to supply the home demand for consumption, which remained nearly stationary, notwithstanding the progressive increase of population ; though there is no doubt the consumption would have increased in the like proportion, but for the high prices at which the article was maintained.

The average price of all sugars in Calcutta for the three years, 1846 to 1848, was 9 Rupees 12 annas per maund. The bulk of this was cane sugar from the Benares and adjacent districts, but date sugars fully participated in the high rates, and began to form, as above shown, an important part of the exports. Prices ranging from 5 to 7 Rupees per maund were usually current during this period for good date and *gurpatta* sugars, being fully fifty per cent. higher than what have been proved during subsequent years to afford good and remunerative returns to the producers.

Throughout the decade then above reviewed, 1837-38 to 1847-48, every encouragement for the increase of date tree cultivation was in operation. Steady demand, high prices, and a near and ready market at Calcutta were experienced ; and in addition to these, the demands of the European sugar refiners helped materially to encourage the production of the inferior descriptions. The first European refinery in Bengal was established in 1829 in the Burdwan district, but owing to the differential duties on sugars exported to Great Britain, its operations were restricted to very narrow limits until 1837-38. Encouraged by the equalization of the duties, competitors then appeared, principally in the vicinity of Calcutta. Their proprietors were not slow to discover the good qualities of date sugar as raw material for refining, they drew largely from the Jéssore and Furreedpore markets ; and, supported as they were by English

capital, they contributed in no small degree to stimulate the cultivation.

Apt and ready as the Natives of Bengal are known to be, to follow up any branch of industry affording such profitable returns, it might well have been expected that the increase of date tree produce under the very encouraging circumstances, acting over a course of years, as detailed above, would have proved much larger by the year 1848 than this estimate has made it. Undoubtedly during those years, and more especially in the later portion of them, the setting out of new plantations throughout the date districts was very large; but it must be remembered that the tree is of slow growth, that for the first five years after planting no produce is obtained from it, and that it comes to full bearing only in its eighth year of growth. This will be sufficient to account for the increase up to 1848 being so much less than it has been under less favorable circumstances, and under lower prices, during subsequent years, when the trees planted during such prosperity came successively to fruition.

We have next to consider the first great check experienced by the cultivators. The principles of free trade were rapidly gaining ascendancy in Great Britain, and in 1846 the Legislature enacted, in defiance of and contradiction to all its previous tendencies for half a century, that in the article of sugar only, slave labor and the slave trade should be encouraged, and that, by a scale of duties gradually assimilating, the sugar produce of all the world, by the end of seven years from that time, should be admitted to British consumption on equal terms. The first effects of this measure were the English markets being inundated with supplies of foreign sugars, and towards the end of the following year 1847, a panic there and throughout our sugar colonies. Ruin at last overtook many a West India proprietor, who had struggled so far against the difficulties of slave emancipation, whilst in Bengal all sugars fell in value to below the cost of

production, and large sums of British capital invested in sugar refineries there, were suddenly annihilated.

But the operation of the change had only commenced and was soon to be more fully developed. The notion was very prevalent that no sugar grown by free labour could compete in cheapness with that raised by slaves, and the stimulus now given to the production of slave-grown was greater than ever. Great Britain, as the largest sugar consuming country, became the focus of this increasing trade for all Europe. In the year 1851, it reached its culminating point, and a second glut and panic in that year were the result. In January and February, 1852, sugars in Calcutta, were next to unsaleable. The date crop would have been a large one but for this discouraging crisis of the trade during these, the best months for gathering it. But the poor date tree cultivator finding no immediate sale for his goor at a price that would cover the cost of collecting and boiling it, abandoned the trees, allowed the sap to run to waste, and turned his hand to more profitable agriculture.

The business of date tree cultivation being, with two or three isolated exceptions, entirely carried on by the impoverished ryot of Bengal, we cannot but conclude that during these two periods of depression at least, all planting of young trees was suspended, and all care of young plantations neglected, but it is probable these checks were much more lasting in their effects, and that the planting since 1848 has not continued in the same increasing ratio as before that year.

Still the production continued to increase, and the average annual produce in dry sugar, may now, 1857-58, be estimated at 35,000 tons, of which one-third disappears in native consumption in various forms in the date districts themselves, or those adjacent thereto, and the rest remains for export via Calcutta. Had the cultivation not received the checks just alluded to, there seems no doubt the produce would have

again quadrupled during the last eight years, as it did from 1838 to 1846.

To sum up the progress of the cultivation it appears that

in $\left. \begin{array}{l} 1792 \\ 1813 \end{array} \right\}$ it averaged 550 tons or 15,000 mds.

in 1833 it was 3,300 tons or 90,000 mds.

in 1837 it was 3,700 tons or 100,000 mds.

in 1848 it was 15,000 tons or 405,000 mds.

in $\left. \begin{array}{l} 1854 \\ 1858 \end{array} \right\}$ it averaged 35,000 tons or 953,750 mds.

So great and steady an increase in the cultivation notwithstanding partial checks, is sufficient evidence of its value as a remunerative branch of industry, and this is the more patent when we remember that the increase was the natural result of advantages derived from it by the small ryots of the date districts, and not due to any aid from the capitalist, European or Native, applied direct to the cultivation. On the contrary it is but too well known that the poor proprietors have suffered much discouragement from the proverbial rapacity of their landlords, the Bengal zemindars, who seeing the prosperity of their ryots consequent on the long run of high prices, seized every pretext to levy additional and novel taxes on the trees and their produce, and thus to appropriate to themselves a goodly share of the profits arising from the advance in the value.

SECTION III.

Native Method of Cultivation, and Sugar Manufacture.

It has been mentioned in a preceding page that the date tree is always cultivated in Bengal; so little care and labour are however bestowed on the trees after they are planted out by the native ryots, that the cultivation they receive is of a very limited character. The young plants are raised from seed sown during the rains, and are ready for planting out in the following April or May, after the first showers of the

season have moistened the ground sufficiently. Before the date sugars became important as a staple for export, and the cultivation extended, the trees were seldom seen planted elsewhere than along the hedge-rows or boundaries of the fields, or on other spots where they did not interfere with the growth of cereals or other field crops. Gradually as date produce became more valuable, systematic plantations appeared, and fields were set with trees 10 to 15 feet apart, but without much regard to order or regularity of distance. After planting no manuring or further expence was incurred, except perhaps in supplying fresh plants in place of those destroyed by cattle.

The spaces between the trees are generally occupied by oil-seed or other dry weather crops, and thus the cost of a Native plantation is reduced, whilst the trees benefit by the ploughing, which loosens the earth, and the ground is kept free from weeds.

The usual computation of the Native cultivator is that a beegah of ground should contain two puns of eighty each, or 160 trees. On a standard beegah of 14,400 square feet this would require the trees to be planted about 10 feet apart. The cost per beegah so planted to cover expenses of the first five years, during which no produce is obtained from the trees, may be reckoned as follows :

	R.	A.	P.
Cost of 160 young plants,	1	0	0
Planting,	1	0	0
Half* the rent at 2 Rs. per annum, .. .	1	0	0
Ploughing 4 ans., weeding 8 ans., in all Rs.1-12			
for 5 years, is,	8	12	0
	<hr/>		
Total Rs.	10	12	0

At the expiry of the fifth year from the planting of the young tree in the field, it is ready to be tapped for its juice. This

. * The other half being chargeable to the crop cultivated between the trees.

is the average time allowed, though it may be varied a year sooner or later by the difference of soil and climate. The first year a young tree is tapped, it is reckoned to yield only half the usual quantity of juice produced by a full grown tree; for the second year of tapping it is reckoned to yield three-fourths of full average quantity; and it is not till the third year of bearing that it is considered as in full yield.

The process of tapping and extracting the juice commences about the 1st of November. Some days previously the lower leaves of the crown are stripped off all round, and a few extra leaves from the side of the tree intended to be tapped: on the part thus denuded a triangular incision is made with a knife about an inch deep, so as to penetrate through the cortex, and divide the sap vessels; each side of the triangle measuring about 6 inches, with one point downwards, in which is inserted a piece of grooved bamboo, along which the sap trickles, and from thence drops into an earthen pot suspended underneath it by a string: the pots are suspended in the evening, and removed very early the following morning, ere the sun has sufficient power to warm the juice, which would cause it immediately to ferment, and destroy its quality of crystallizing into sugar.

A plantation is always divided by the cultivator into seven equal sections, and one such section is cut afresh daily. The cutting is made in the afternoon, and the pot suspended as above mentioned: next morning the pot is found to contain, from a full grown tree, 10 seers of juice, the second morning 4 seers, and the third morning 2 seers of juice; the quantity exuding afterwards is so small that no pot is suspended for the next four days. On the evening of the seventh day it again comes to the turn of this section of trees to be cut, which is effected by a thin slice being pared from the triangular face, which by again dividing the sap vessels causes the juice to flow afresh as at first. Each section is thus cut in succession, and the process is repeated

throughout the goor season, which usually terminates about the 15th February, after which the heat of the weather causes the juice to ferment so rapidly, that it is no more convertible into sugar, and consequently not worth the labour of extraction and evaporation of its water, as molasses only would be the product. Juice produced during the day-time of the cold season is of similar quality, and for the same reason is allowed to run to waste.

The ordinary date sugar crop season is therefore about three and a half months in duration, reckoning from 1st November to 15th February. A fall of rain however entirely stops the collection of the juice, and the heavy damp fogs to which the date districts are very subject, cause the juice to ferment, and render it comparatively valueless. From these causes one-fifth must be deducted from the whole period of the season for weather casualties to arrive at the total number of *effective* days for goor yielding, which will thus be found to be about 85 days. Assuming the whole period at three and a half months or 107 days, and dividing these into periods of 7 days for each interval for fresh cutting, we have 15 and $\frac{2}{7}$ ths as the average number of cuttings to each tree, and this multiplied by 16 seers, the quantity of juice yielded during the three days after each fresh cutting, and deducting $\frac{1}{5}$ th from the total result for casualties of weather as above, we arrive at the total produce in juice from each tree for the whole season, which is thus found to be bazar maunds 4-36-4.

If we now multiply the quantity of juice yielded by each tree for the season by 160, the usual number of trees reckoned to a beegah of ground, we have bazar maunds 787-20-13 as the total yield of juice from a beegah, and as ordinary juice yields $\frac{1}{10}$ th of its weight in goor, we thus find bazar maunds 78-30 as the produce in goor per beegah, being nearly 19 $\frac{3}{4}$ seers as the average produce of each tree for the season.

Let us now proceed to examine the mode of preparing the goor, or first raw product from the juice, and the cost of the process.

Daily at sun-rise throughout the goor season, the industrious ryot may be seen climbing his trees, and collecting at a convenient spot beneath them the earthen pots containing the juice yielded during the past night. Under a rude shed, covered with the leaves of the date tree itself, and erected under the shade of the plantation, is prepared the boiling apparatus to serve for the goor season. It consists of a hole of about three feet in diameter sunk about two feet in the ground, over which are supported by mud arches, four thin earthen pans of a semi-globular shape, and 18 inches in diameter, the hole itself is the furnace, and has two apertures on opposite sides for feeding in the fuel, and for escape of the smoke. The fire is lit as soon as the juice is collected, and poured into the four pans, which are kept constantly supplied with fresh juice as the water evaporates, until the whole produce of the morning is boiled down to the required density. As the contents of each pan become sufficiently boiled, they are ladled out into other earthen pots or jars, of various sizes, from 5 to 20 seers of contents, according to local custom, and in these the boiled extract cools, crystallizes into a hard compound of granulated sugar and molasses, and is brought to market for sale as *goor*.

The fuel mostly employed for the boiling process is the soondree wood (*Heritiera minor*) which forms the principal part of the wild tree vegetation of the Soonderbunds, and, from their contiguity to all the date districts, it is supplied as a cheap fuel to every part of them. The under-leaves stripped from the date trees form a part of the fuel used also. Next to the cost of labor in the process, the cost of the fuel is the most expensive item in the production of the goor by the native method. It is reckoned that for boiling the juice throughout the season from one beegah of ground or 160 trees, 400

maunds of sondry wood are required, in addition to the dried date tree leaves, which at 5 Rs. per 100 mds., which is probably an average rate in and near the Soonderbunds, gives 20 Rs. per beegah.

In estimating the cost of the goor an annual charge must be included in the calculation for the expenses of the plantation. It was shewn at page 254 that the aggregate cost to the ryot for the first five years was Rs. 10-12; but as no further ploughing and weeding are given after the trees commence yielding, which they do from that time throughout an average period of 20 years, we may assume one rupee per beegah per annum as an ample representation to the ryot for the actual labor of cultivation.

One half of the annual *rent*, or one rupee per beegah, should also continue to be included in the estimate.

The labor of collecting and boiling the juice is however the largest item in the list. The ryots are accustomed to reckon one headman at 4 Rs. per month wages, and two tree climbers at 3 Rs. per month each, are required for 200 trees, and these for a season of $3\frac{1}{2}$ months will cost 35 Rs. By the same rule the proportion for a beegah of 160 trees would be 28 Rs.

The total cost of the produce of a beegah may be summed up as follows:—

Annual proportion of expence of cultivating,	Rs.	1	0	0
Annual half rent of ground,	1	0	0	
Labour, cutting trees, collecting, and boiling, ..	28	0	0	
Cost of fuel,	20	0	0	
Earthen pots, pans, tools, &c., &c.	10	4	0	

Total, Rs. 60 4 0

The charcoal from the fuel used is calculated

to yield, 1 0 0

Leaving Rs. 59 4 0

as the nett cost of 78 $\frac{3}{4}$ maunds of goor, the produce of a beegah as shewn at page 256, or, as nearly as can be reckoned, 12 annas per bazar maund as the actual cost to the ryot, leaving him a bare return for his labour expended on it.

That the above is an approximate estimate of the actual cost of production was exemplified in the season of 1851-52, so disastrous to the date sugar produce, as adverted to at page 252. In that season the ryot continued to manufacture the goor and bring it to the village markets for sale until the price gradually fell to 12 annas per maund. When this rate could no longer be procured, the trees were abandoned for the remainder of the season.

SECTION IV.

The Native Date Sugars, and the modes of their Manufacture from Goor.

The estimates of annual production and exports of date sugars given in Section II, referred only to such descriptions of the produce as had been cured or refined, and must be distinguished from the *goor*, or first product from the tree, as prepared by the cultivators by boiling and evaporating the water present in the sap. The subsequent processes by which the goor is deprived more or less of its molasses and impurities, and the drier and more merchantable kinds of sugar are prepared for market, will now be briefly described. These processes are always conducted by a distinct class of operators, who purchase the goor from the cultivators, and bring it to various stages of purity and dryness under different denominations.

1st. *Khaur* is made by filling the goor into coarse sacks or gunny bags, and pressing them between bamboos lashed together, or beneath heavy weights, until 30 to 40 per cent. of the entire weight is forced out in the shape of molasses. The residue is then mixed, packed in clean bags, and is ready for sale.

2nd. Fine Khaul or Nimphool is made by repeating the above process for making khaul ; the only difference being that the khaul is sprinkled and mixed with water before subjecting it to the second packing and pressure. This causes a further portion of the molasses to be washed and separated from the mass, and the product is lighter colored and finer than the khaul, and about 50 per cent. only of the original weight of goor remains. A third application of the same process is sometimes resorted to, which carries away another 5 per cent. of the original weight, and leaves a residue still drier and lighter colored than the ordinary nimphool.

In all nimphool and khaul sugars, however, a certain portion of water or moisture remains, it being never subjected to any sun-drying or other process for evaporating the water, and this renders it liable to deliquesce and sweating through the bags in which it is usually packed. This is especially the case in damp weather, and loss of color and acidity follow in a few weeks.

3rd. Dullooah, or Doloo, is made by filling the goor into round baskets or conical earthen vessels holding two to three maunds each. The baskets being of an open fabric, and the cones made with a hole at the apex, the molasses drains from the goor into a vessel placed beneath, the process being encouraged by a stratum of 3 or 4 inches thick of a wet grass or aquatic weed called "seala" placed on the surface of the goor. The moisture from this attenuates the molasses in the goor and assists the draining. As soon as the weed is dry it is removed, and the upper stratum of the goor, now deprived of its molasses, is scraped off with a knife to the depth of 2 or 3 inches ; and a fresh top of "seala" or wet weed is applied : when dry, a further portion of sugar is cut off as before, and this is repeated until the basket or cone is emptied. The sugar as scraped off is exposed in the sun on mats to dry, and is then mixed and packed for

sale; and is, when well made, a dry, light, sand-colored dullooah. Thirty to forty per cent. of produce, varying with the quality of the goor, is made in this way from a given quantity of the latter. The resulting molasses having by the operation of the weed a small portion of the sugar-crystal melted with it, is subjected to a boiling to evaporate the water, and an inferior, weak grained, and dark coloured goor is the result: this is again subjected to the weed draining as before, and a further portion of ten to fifteen per cent. weight of the original goor is obtained. Dullooahs, if well dried before being packed, may be kept without deteriorating for several months if the weather be dry; but they always imbibe moisture, and sustain consequent injury from the damp air of the rainy season in Bengal.

4th. Pucka Cheenee, or Gurpatta, is the Native refined sugar, made by subjecting khaur to a process somewhat resembling that of the English refiner. The khaur is melted in water to the consistency of thin syrup, which is then placed over a fire in an earthen pan, and brought to boiling point, the defecation being assisted by potash temper and sprinkling in of cold water. After scumming, it is filtered through a cotton cloth, and the clarified syrup is then boiled briskly until the water is evaporated to such a degree as to allow the sugar to form a hard crystal as it cools. It is then poured into an earthen cone, and when cold the plug is withdrawn, and the syrup allowed to drain from it, assisted, as in the dullooah process, by the application of the damp weed or seala. As it becomes whitened by the latter, it is scraped off, sun-dried, and packed for sale. The syrup, as it collects from the cones, is boiled up with fresh goor, and produces by the same process an inferior or second quality of gurpatta, and the syrups of the latter are once more boiled alone, and produce a still inferior weak and reddish sugar called by the manufacturers "jerunnee," which is literally "lasts." Gurpatta if well made, and pure from mixture with other

kinds, is of a bright and clean aspect, fine and dry; and if protected from the weather will keep without injury throughout the rainy season. The ordinary yield of gurpatta from good goor is reckoned as follows: three maunds of good goor yield of—

					mds. srs.
First or white gurpatta,	..	..	..	0	20
Inferior or mixed ditto,	..	..	..	0	10
Syrups or jerunnee,	..	..	..	0	10
Molasses,	..	..	..	1	28
Loss,	..	..	..	0	12

Total, Mds. 3 0

5th. Dobarah is a quality superior to gurpatta, being a good white, dry, and well crystallized sugar. The process is similar to that of the gurpatta; but the material used being dullooa instead of khaur, a purer sugar is obtained, which much resembles the crushed refined sugar of the European refiner.

The expence of all the Native processes above described is extremely low, carried indeed to the last stretch of economy. Earthen pottery for boiling and crystallizing vessels, thatched sheds for protection from the weather, and bamboos and gunny-bags the sole substitutes for machinery, the expence of apparatus forms but a small item in the cost of the sugar. The labor forms the most important part of the expense, and next to that the cost of fuel, more especially in the twice-boiled descriptions.

It remains to notice that a considerable change has come over the business of preparing Native date sugars during the last ten years, arising from the increased demands of European sugar refineries in the vicinity of Calcutta, which have encouraged the production of a larger proportion of the date crop in the form of raw material best suited for them to

operate upon. These establishments have now been in operation for a sufficient period to prove that they can fulfil their purpose of preparing from the native raw product such qualities of sugar as are suitable for the consumers in the markets of Europe and Australia, and that they can do this with success and profit to the refiners, and with a better return to the shippers, than would be realized by the latter shipping the raw material, bearing the same rates of freight and charges. The experiment has now been fairly tried, and the result clearly arrived at, that the Native refiner, notwithstanding the extremely low cost of his apparatus and economy of labour cannot compete, in the preparation of the twice-boiled, or refined, sugars, with the European refiner operating with the vacuum pan and steam-engine, and above all with the aid of animal charcoal, the most valuable of all agents in modern sugar refining. It is true that the manufacture of Native refined sugars, dobarah, and gurpatta or *pucka cheenee*, is still nominally continued, but on a much reduced scale, and of inferior qualities to the product of a few years back; and it needs no great amount of vaticination to foresee that the art of preparing them, like that of the Dacca muslins of former days, is gradually becoming extinct, and superseded by the more scientific processes of Europe. The town of Santipore, on the Hooghly river, which twenty years ago produced from 20,000 to 30,000 maunds of dobarah sugar, for which it was much celebrated, per annum, now produces but a very insignificant quantity, and that is seldom seen in the market; and of gurpatta or *pucka cheenee*, but very little of good or genuine description is seen in Calcutta, the bulk of what is brought to market under those names, being now-a-days largely adulterated with dullooa or nimphool sorts, to reduce them to a price suited to the refiner for his use as raw material, either in Calcutta or in Great Britain.

SECTION. V.

On Improvements in the Cultivation and Manufacture.

In the preceding Sections, the endeavour has been made, first to trace the history and progress of the date tree cultivation, as a branch of native industry in Bengal;—secondly, to present a distinct view of the present state of the cultivation and elimination of the first raw product, or goor by the native husbandman; and, thirdly, to give a descriptive sketch of the subsequent treatment of the goor in the hands of the Native refiner, who brings it to various stages of purity, to suit the wants of the Native consumer or the European refiner.

There remains to be considered, in conclusion, how far the tree cultivation itself is capable of improvement, and whether a more economical development of its products could be attained, either by conducting the cultivation on an extensive and systematic scale, through the application of capital in forming date tree estates:—or by modified applications of European science and apparatus, already applied with success in refining from the goor, to the whole process of manufacture, commencing directly from the juice;—or by both these influences combined.

In the systematic cultivation of the tree, experiment has already proved in more than one favourable locality, that it can be conducted under few obstacles, and with every prospect of success as a remunerative investment. In Jessore district a plantation of 2,000 beegahs has been for several years past gradually forming, and will no doubt in due course become a far more valuable sugar estate than any of equal size in the West Indies or Mauritius, and amply repay the projectors for their patience and foresight. Another extensive plantation is already far advanced in the Hooghly district, and others have been commenced in the Soonderbund grants. In these plantations the trees are planted at uniform distances of 10 or 12 feet apart, and over regular

and uninterrupted tracts of land, so as to economize space and facilitate supervision.

To demonstrate the remunerative character of such an investment by a simple calculation, it will suffice to estimate the outlay required until the trees attain their proper growth for yielding goor, and to set off against this the revenue to be derived by leasing out the trees to the native cultivators for extracting the product on their own account, as customary with the petty Native tree proprietors in the date districts.

In Section III, the expence to the ryot for cultivating a beegah of the trees was estimated at 10 Rs. 12 as., inclusive of rent for five clear years, before any yield is obtained, and of every contingent expence for that period. There appears no reason for assuming a higher rate for planting on an extensive scale as the base of the calculation; to which should be added however, 1st, the charge for interest on capital invested in the plantation until the trees attain to yielding, and 2nd, the cost of general superintendence. In the following estimate, the interest on capital is allowed for at the Indian rate of 10 per cent per annum, and the cost of superintendence is assumed at 200 Rs. per month for a cultivation of 2,000 beegahs. It may be remarked on the latter item, that the labour of superintendence would be light; and it may be presumed that a portion of the time of a European planter, assisted by a good Native gomasta, would suffice for the work. In addition to the above rate for salary also, a further source of profit to pay for superintendence may be reckoned on from the between crops. At page 254 it was estimated that half the rent of the ground should be charged to the short crops cultivated between the trees. Rape, linseed, and teel are known to thrive well in such circumstances, and probably all the dry weather crops would do so equally well; and on ground already cleaned and ploughed for the date trees, such crops are raised at trifling expence, and meet a steady and remunerative market at Calcutta.

The estimate of outlay will therefore stand as follows :—

Outlay on 2,000 beegahs for plant- ing and cultivation for five years, at Rs. 10-12 per beegah,	Rs. 21,500
Superintendence at 200 Rs. per month for 5 years,	12,000
Interest on the above at 10 per cent., viz.,	
On 1st year's outlay on plants and planting at 2 Rs. per beegah,	4,000
„ Rent and charges on ditto at 1-12,	1,750
„ Superintendence at 200 Rs. p. m.,	2,400
	<u>8,150</u>
which at 10 per cent. for 5 years is,	Rs. 4,075
On 2nd year's outlay, viz.,	
„ Rent and charges @ 1-12	1,750
„ Superintendence @ 200 Rs. p. m.	2,400
	<u>3,900</u>
which at 10 per cent. for 4 years is,	Rs. 1,660
On 3rd year's outlay as above 3,900 Rs. for 3 years,	1,245
On 4th year's outlay as above 3,900 Rs. for 2 years,	830
On 5th year's outlay as above 3,900 Rs. for 1 year,	415
	<u>Total Interest, 8,225</u>
Total Expence for 5 years	Rs. 41,725

For the returns as profit on such a plantation, if leased out to Native goor boilers as above proposed, the estimate would be thus :

2,000 beegahs each with 144 trees, the standard beegah containing 14,100 square feet English measure, and the trees being planted 10 feet apart, will give a total of 288,000 trees. And these leased out at a rent of 10 trees per rupee per annum, will yield an annual rent of, Rs. 28,800

Deduct annual charges as before for rent &c. at 1 Rs. 12 ans. per beegah, and superintendence at 200 Rs. per month, Rs. 3,900

Leaves nett annual income, Rs. 24,900

Which on an outlay of Rs. 41,725, gives a return of fully 60 per cent.

The rate at which the trees would be let out is taken at 10 per Rupee per annum. During the prevalence of high prices for sugar the rate in the date districts has been much higher, being frequently at 6 trees, and commonly at 8 trees per Rupee per annum. The rate of 10 per Rupee for trees in all stages of bearing, after the fifth year of growth, may therefore be considered an ordinary rate.

A cultivation holding out so tempting a rate of profit, and that upon a limited outlay of capital, and attended with so small a share of the common risks of agriculture, might well have been expected to have recommended itself earlier to the European planter and capitalist ; and their not having availed of it might seem *prima facie* to warrant a doubt of the correctness of the calculation on which such profits are based. The explanation of this is found in the following reasons :

1st. The length* of time required to obtain any returns from the plantation. To the European merchant or planter

a lapse of eight years to be passed before a profitable return can be realized, is too long a section of what most European residents hope to be the period of their sojourn in India. The fear of failing health in prospective, and the high rates of interest on mercantile capital always present to their notice, cannot fail to influence them, and to render any cultivation, which will offer a quicker return for their labours, the more attractive, however greater the risks attending such crops, indigo for example, may be.

2nd. The obstacles to the acquirement of permanent land tenures, and the general insecurity of titles to estates in Lower Bengal, are great drawbacks to investments in the soil requiring a series of years for development, however profitable *in prospectu*.

The remedy for both these objections is to be looked for in the gradual improvement in the administration of the government of the country, and in the more general introduction of the civilization of Europe, as working by its improved arts and manufactures, which such a government would foster. It has been but too often demonstrated that from the Native Zemindar of Bengal, however wealthy, or enlightened by school education, no enterprise or experiment will be undertaken which would lead him off the beaten track, by treading which he derives a certain revenue from his estates, however pressed or extorted from his impoverished ryots. With some few honorable exceptions, any project for improving the condition of the ryot, or any scheme for the improvement of the country by the application of the scientific or social systems of more civilized countries, finds no favor with the Native landholder ; neither the steam navigation of his rivers, nor the most promising railway lines through his primæval jungles find support from him. These, and the introduction of foreign staples into the agriculture of the country, have been left to the exertions and capital of the foreign ruling nation. It is to the same source we

must look for any greatly extended and systematic pursuit of this valuable cultivation.

To the manufacture of the date juice into sugar the European methods have not hitherto been applied in any way, and where, as in this case, experiment has been entirely wanting, any suggestions for improvement must be founded entirely on theory:—those about to be made, can only claim, in addition to this, the merit of having been made after frequent local observation of the Native process for the production of goor. So large and growing a branch of agricultural industry carried on by such rude and simple processes, and with so vast an expenditure of manual labor in proportion to the results, would seem to offer a fair field for the application of economical contrivances.

At page 258 it was shewn that of the total expenses of producing the goor from one beegah of date trees reckoned at Rs. 59-4, Rs. 28, or nearly one half, was for the item of labor: this is expended principally in the active, and often dangerous, service of climbing the trees twice daily, to empty and reset the earthen pot in which the juice is collected. Any process, which would materially reduce this labor ought *primâ facie* to effect a proportionate reduction in the cost of the goor.

It would seem quite possible to effect this by discarding the earthen pot altogether, and conducting the sap flowing from the trees of several beegahs of plantation to a common reservoir planted in a central position, to which the sap might flow along a series of gutters slightly inclined towards it. With the scattered and irregular planting of the Native ryots this would of course be impracticable, although not so in a systematic and regular plantation.

Let us suppose for example a square of 100 beegahs of regularly planted and full grown trees, divided into equal quarters of 25 beegahs each, and a reservoir or juice boiler placed at the point of intersection of the dividing lines, as in

the accompanying sketch, then suppose that a tributary gutter be placed between every second row of trees, as from A to B, and that these tributaries are all made to incline towards a main gutter inclined from B to C. It will then only require a short gutter to slope from the notch cut in each tree, and to conduct the sap into the tributary, and it is evident that the whole product of the 100 beegahs would flow in a continuous stream to the central point at C. Here the operation of boiling into goor might be conducted without intermission in two or more vessels, the juice being conducted into each alternately as required, the operator boiling all into goor as soon as collected.

It is obvious that by this method two-thirds of the labor of tree climbing would be saved, and the produce might reasonably be expected to prove of better quality than by the ordinary method, inasmuch as on the juice being brought to a boiling temperature within a few minutes after its leaving the tree, all fermentation would be obviated : it is even probable that the juice which exudes during the day, and which is now wasted by the cultivator, owing to its so rapidly passing into fermentation, might by this means be economized, and a considerable per centage of additional produce be thus obtained from the tree.

The only objections which present themselves to the application of this process are, 1st, the somewhat irregular growth of the trees, which might render it difficult to obtain the required elevation from the whole of those situated farthest from the centre ; and, 2nd, the expence of guttering. To the first it may be remarked that irregular growth is mainly owing to defective planting, either by using seedlings of various growths and seasons, or by allowing the young trees to be cropped by cattle, which either stunts their growth, or necessitates their being replaced subsequently to the original planting. By care in the original selection of the plants, and by fencing the young plantations, these evils

might be prevented ; and that a generally regular height of trees could be attained is sufficiently evident from the appearance of plantations where no endeavours have been made to promote it. The expence of gutters would not be so great as might at first glance be expected. It would be found that for all the tree gutters, and probably for all those I have denominated tributaries, the large hollow kind of bamboo, divided longitudinally, and with the medullary divisions removed, would answer all purposes, light wooden drains of saul or jarool being required only for the four main channels. Without troubling the reader with details in this place, it may suffice to state, that the total expence of gutters, including wooden supports, for a square of 100 beegahs, has been estimated at a first cost of 2,400 Rs., or 800 Rs. per annum, assuming that they would serve for three years' use. If preserved by a previous immersion in creosote they might be expected to serve much longer. Then, reckoning the expence of labour as at page 269 at 28 Rs. per beegah, or 2,800 Rs. per 100 beegahs per annum, and that two-thirds of this could be saved by the new plan, the labourer having to climb the tree but once a week to recut the sap vessels, in lieu of twice a day for three or four days consecutively as at present, and we have a saving in cost of Rs. 1,067 (viz., two-thirds the labour 1,867 Rs. less for guttering 800 Rs.) for the season, besides what might be derived from the improved quality of produce obtained, and from any extra quantity derived from the day juice. Looking at the evident tendency to an advance in the rate of labour in Bengal, these suggestions may be found valuable to the intending planter.

Whether any advantage could be obtained by applying to the date juice the improved sugar refining processes of Europe, such as the vacuum pan, the animal charcoal filter, and the centrifugal machine, is a question on which it is more difficult to theorize than on that of improving on the Native process for producing goor. It has been found

difficult to apply such improvements on sugar-cane estates, it remaining an open question whether the improvement in the product is sufficient to counterbalance the large outlay and apparatus which can be used only during the gathering of the crop. If this is the case with cane cultivation where the whole produce of any particular field is gathered, collected at a central spot, and its sugar extracted and prepared in a few hours, it is easy to comprehend that there are at least equal difficulties to be solved in applying them on a date plantation, where the produce is collected over three or four months, and has to be conveyed in a liquid state over considerable distances if required to be collected in quantity.

An ordinary sized vacuum pan contains about 100 maunds of sugar, and we may suppose it to be charged full at least three times daily throughout the date crop season of 90 working days, as the minimum of duty it would have to perform to compensate for the expense of its erection. This would require 300×90 , or equal to 27,000 maunds of goor, to be collected for it, or about 1,000 tons. As the date juice contains only one-tenth of its weight of solid sugar, it follows that about seven-eighths of the whole would have to be evaporated in the vacuum pan, to bring the residue to the proper density for crystallization, and to effect this it would be found that not more than three charges for 24 hours, as above estimated, could be completed. And taking the yield of goor per beegah, as at page 256 at $78\frac{1}{2}$ maunds, it follows that an area of 343 beegahs of trees in full bearing, would be required to supply this. Under the most favorable circumstances the result would be, that to produce 1000 tons of uncured sugar, or goor, eight times that weight of juice would have to be conveyed over distances varying within a radius of half a mile, at great expense of labour, and great risk of loss by fermentation.

A far more promising mode of operation would be to subject the juice to a preliminary boiling in open vessels as it leaves

the trees, sufficient to evaporate the greater portion of its water and occasion a partial crystallization; and to collect this extract, to be subject to a process resembling that of an ordinary sugar refinery, to complete its conversion into the best qualities of sugar.

It is well known to sugar refiners that the deterioration in crystal and color which all saccharine juices suffer from long exposure to high temperatures, takes place to a limited extent only until after the greater part of the aqueous portion is evaporated. The more economical plan of operation therefore would be, first to divide the date plantation into convenient sections for collecting the juice and subjecting it, fresh from the trees, to the preliminary open air evaporation until it indicates 45 degrees of Beaumè's saccharometer: this would effectually obviate loss by fermentation, and allow of a partial crystallization in cooling. The product could then be conveyed to the central factory, and worked off at convenience, by reducing it with water to the density of 25 degrees of Beaumè, heating to boiling point for the purpose of coagulating the glutinous portion, and then straining the clarified liquor through animal charcoal, and passing it from thence to the vacuum pan, there to be crystallized in the ordinary way. The vacuum pan having by this method to evaporate the water from a much denser liquor, would occupy for each charge less than half the time it would have required with the raw date juice, and consequently could operate on double the quantity of sugar in the same space of time, add to this that a portion of the material might be kept by, so as to extend the working season over four or five months, and it would be found that 3,000 tons, or fully three times the quantity of material could be worked, as compared with the plan of working at once on the juice in vacuo, for a season's operations.

The above described process, as well as that for collecting the juice suggested in the previous pages, requires, it may

be repeated the test of experience; but with this reservation, there appears no reason to doubt that the two combined would establish a vast improvement on the present Native method; and that the whole available product of the tree would be obtained in an improved state, and with the minimum of waste in the manipulation: finally, that the increase of per centage in weight obtained; the improvement in quality, and the economy in working expense always realized by operating on wholesale quantities, would, all combined, be found to more than compensate for the necessary first outlay for efficient apparatus, and superintendence.

The general conclusion pointed at throughout the foregoing pages, is that the production of date sugar is one of the most important and valuable pursuits which can claim the attention of the Bengal planter or landholder, European or Native, whether we consider the highly remunerative returns the crop affords, its immunity from risks of failure, or the valuable nature of the product, as one of the necessities of life. The writer has the conviction that its merits require but to be more generally known to recommend it to the body of British capitalists and British settlers in India, whose numbers under the influence of recent political events are increasing, and must continue to increase. Fairly considered, there is nothing extravagant in the prognostication, that date tree estates may after a few years prove as remunerative in the plains of Bengal as tea estates promise to be along the hill slopes by which those plains are bordered.

The Green Dye of China and Green Dyeing of the Chinese ; by Monsieur NATALIS RONDOT, with sundry papers on the same subject by other authors : Translated from the French by HENRY COPE, Esq., of Umritsur.

PREFACE.

I received from Shanghai, subsequent to the year 1853, sundry information regarding the green dye of China. These notices were, in some degree, supplementary to those forwarded from China by the Rev. Father Louis Helot, and the Rev. Joseph Edkins. The Chamber of Commerce of Lyons having decided on the proposition of Mr. A. F. Michel, one of its members, to offer a prize for the investigation of the green dye of China, in regard to exotic and indigenous plants, it became necessary to add certain explanations to the documents previously published, and to make known to the public all the facts bearing generally on the art of green-dying by the Chinese. I re-arranged all my notes with this object, and forwarded them to the Chamber of Commerce. They were accompanied by a letter, dated the 18th March, 1857. They were read to the Chamber at a meeting held on the 10th April, and the institution did me the honor to order them to be printed.

Since then I have instituted still more extended enquiries, and I have obtained most useful particulars, on points hitherto obscure. Mr. J. Decaisne, of the Academy of Sciences, has been so good as to undertake the description of the two species of *Rhamnus*.

I have thus been led to modify the paper I presented to the Chamber of Commerce, which accepted my more recent work on the 24th July, being the third which has been published by order and under the auspices of the Chamber of Commerce of Lyons.

The first edition exhausted, includes the report of Mr. Michel ; the successful attempts of Messrs. C. Benner,

Dupway, and others, were therein explained and discussed. No chemist, dyer, or printer, who has communicated the results of his experiments to the Chamber, has been more persevering and more successful in his labours than Mr. Michel. He has detailed in his report his own peculiar observations, and the process of analysis and of dyeing which he has discovered.

The second publication contained several documents, of which the most interesting came from the Rev. Father Helot. They were prefaced by a more recent report from Mr. Michel. That gentleman has undertaken, since January, 1857, with the ability and intelligent precision for which he is so well known, investigations into the coloring matter of indigenous *Rhamni*. These investigations have resulted with the discovery of the *lo-kao*, in the still more important discovery of the peculiar and very remarkable action of light on certain vegetable juices.

It was to be regretted that Father Helot should have reached Azé at a time when the work-shops were closed, and that he was obliged to rely on the reports of the workmen; for as Father Bourgeois wrote from Pekin in 1784, "the local workmen do not tell their secrets"—a saying applicable to the race of the present day. But during a second trip to Azé, in 1857, after the Easter festival, this zealous Missionary saw in practice the singular operations which he had already made known, and he certifies in a letter that will be found hereafter, the correctness of the accounts he had previously given. The first memoir of Father Helot was already considered valuable, but its value has been materially increased by his assurances of its reliability; he illustrates in his person the accounts, so frequently quoted, by which our ancient Missionaries, Fathers Gaubil, d'Incarville, d'Entrecolles, Arnid, Abot, Collas, &c., were so useful, and became so celebrated. The enlightened measures adopted by the Central Council for the work of

the Propagation of the Faith, lead us to hope that both science and art will be indebted for new services and conquests to our missions in China.

It will be observed in the course of my remarks that Mons. C. De Montigny, French Consul at Shanghai, and Mons. D. Remi, of the same town, have taken an active part in these investigations. The discovery of the two species of *Rhamnus* is due to Mons. de Montigny. Our "Chargé d' Affaires" in Siam and Cochin China has materially added to our agricultural knowledge; it is to him we owe the Yak, the Yam, the Dry Rice, Sorgho, &c. Thanks to his influence, and to his intelligent exertions, Lyons, receives, since 1852, direct and important consignments of Chinese silk. My knowledge of the energy, devotedness, and patriotic zeal of my former colleague in the mission to China, is sufficient to assure me that he will do much more than he has hitherto achieved. Mons. Remi is the principal member of a respectable French commercial firm at Shanghai; he has zealously followed out with Mons. Edan, now officiating for Mons. de Montigny, the investigations commenced by the latter, and has afforded me a mass of useful information. It was necessary to know what Chinese books said of the *lo-kao*; one man only could, in Europe, undertake the necessary enquiries in those valuable Chinese and Japanese Cyclopædias, the examination of which is as interesting as it is difficult; but they were a mere pastime to the illustrious translator of the memoirs of Hiouyn-Thsang: but Mons. Stanislas Julien, of the Institute, whose marvellous acquaintance with the Chinese language is as wonderful as his ardent inquiries into the realms of science and the arts, has found no trace of the *lo-kao*, and the plants from which it is obtained, in the botanical and agricultural treatises published about the middle of the last century. The use of this lac in dyeing is not traceable, according to the Rev. Mr. Edkins, for more than 25 years; even its use as a water

colour if less recent, is not over much more ancient. The authors of the *Thien-kong-Khai-wou*, and of the Japanese Cyclopædia, would hardly have passed over in silence such a singular substance.

I am grateful to the obliging services of my friend Mons. Stanislas Julien for the translation of the Chinese texts quoted by me in the course of my remarks.

The author of the "Treatise on the Printing of Tissues," has, in compliance with my request, consented to separate from a "Memoir on the Green Dye of China," that portion in which he details, as the result of his experiments, the chemical and dyeing properties of the lac. It is not necessary for me to indicate the importance of this unpublished work, undoubtedly original in its conclusion, throwing a new light on the history of this truly interesting substance, the origin and true nature of which are still doubtful questions with some men of science.

PART 1ST.

THE GREEN DYE OF CHINA.

I.

Of the Discovery of the Green Dye.

The history of the *Green Dye of China* is singular. Its existence even is no where mentioned before the year 1845. It was obtained in China about that time, and brought to France in 1846, but it continued unknown till 1852; the discovery of its properties dates from 1852. It may be stated that we are still ignorant of the true nature of this most singular substance, and it is difficult to form an idea of the precious and varied resources it offers to the dyer and the printer.

The Commercial Delegation attached to the Embassy in China were the first to obtain the *Green Dye of China*, but without paying any attention to it. There could be no doubt

about it, for what other dye-stuff could be valued on the spot at 224 francs the kilogramme? It is thus mentioned in the "Etude pratique du Commerce d'exportation de la Chine," under the head of "Vegetable Dye Stuffs," page 199 : *Kong-lok*" (in the dialect of Canton). This substance is extracted from the leaves of a tree of that name ; it yields a very valuable green color, comes from Tse-tchonus, and costs 24 dollars per catty. It is used for painting. We obtained this account of it, and the substance itself, from Yi-diong, Senior, one of the first silk manufacturers, and from Ting-Kona, a painter.

It is to be observed that the nominal price has not varied since then. The catty which was 24 dollars at Canton, in 1845, was still obtainable for 24 dollars at Shang-hai in 1857, but the exchange was very different ; it was 5 francs and 65 cents at Canton, in 1845, and at 9 francs at Shanghai in the middle of the year 1857.

I frequently visited in 1845 the dyeries of Canton. I noted in four of the largest, and especially in those of Hou-ching, manufacturer of silks, and of Kong-tching, the process for dyeing cotton and of grass cloth thread, (thread of *Urtica nivea*) ; I never saw them use the *lo-kao*, but it was mentioned to me. I find in my journal, under date 17th August, 1845, that my interpreter Atchum, brought me, with other dye-stuffs I had ordered him to purchase, some *louk-ko*, for dyeing in green, of which the price was 28 dollars per catty.

The Delegates had in their collections some calicoes dyed in different shades of green ; none of these were specially mentioned by them. They were bought at Shanghai, and at E. Moru (Amoy.) These calicoes were exhibited at the Municipal School Turgot, between the 21st July and 28th August, 1846, when more than thirty thousand persons visited the Exhibition, but these green dyes were not then noticed. The *lo-kao* itself was there : 1st, in a box of paints in the form required for painting, (No. 1392 of the Catalogue) ; 2ndly, in the silk-dyeing form, being the small sample I

had purchased at Canton on the 17th August, 1845 (No. 1866 of the Catalogue).

In 1848, Mons. de Montigny, Consul at Shanghai, forwarded to the Minister of Commerce, with other Chinese productions, 44 specimens of calicoes, and some other colouring matters. The calicoes of the collection of the Delegates, and those sent by Mons. de Montigny, were distributed, in October, 1849, amongst the Chambers of Commerce of Malhausen, Rouen and Lille.

The cloths dyed green were named in the Catalogue of Mons. de Montigny, *liou-sai*. Father Helot states (pp. 27 and 32) that these cloths are known to the trade by the name of *so-lo-pou* (green-color-cloth) when dyed with the bark; *ngheou-lo-se* (green-nymphæa-color) and *nghiou-lo-pou* (green-nymphæa-cloth) that is, cloth dyed of the color of the leaves of the *nymphæa*, when dyed with the *lo-kao*.

Each piece of *liou-sai* is seventeen Chinese feet long, one foot, or one foot and one inch broad, and cost at Shanghai, in 1848, 50 to 53 hundredths of a dollar, or (according to the exchange of the day 6 francs 20 cents) from 3 francs 10 cents to 3 francs and 30 cents. The following are the size, weight, and price of three pieces :

6 metres	12 long :	0 35½	broad ;	461 gr. ;	51 cents per metre
6	„ 36 „	0 35½	„	463 „	52 „
6	„ 30 „	0 38	„	467 „	52 „

Father Helot considers that the value of a square metre of cotton cloth dyed with the bark, or the *lo-kao*, is 5 hundredths and 7 thousandths of a dollar (about 50 cents at the exchange rate of 9 francs per dollar.)

Mons. de Montigny also sent, as I have already mentioned, certain dye-stuffs, and there were among them the following green matter :—

“Ten catties (6 killogrammes 047) of *pih-chow-elle* (I give the word as written by Mons. de Montigny himself) green colour ; price 4,920 sapeques (about 26 francs.)

“ Fifty catties (30 killogrammes ·235) of *tong loh*, green paint, said to be prepared from the *no-me*, cost 20,800 sapeques (about 107 francs).”

The Ministry of Agriculture and Trade, by which these samples were distributed, as well as the dye-stuffs brought by the Commercial Delegates, amongst the Imperial manufacture of the Gobelins, the Museum of Natural History, the Chambers of Commerce of Lille, Rouen and Mulhausen, received no notice of the nature of these matters.

Tong-lo is the word for verdigris, and approaches closely to that given to the Delegates (*Tsong-lok*); *Commerce d'exportation de la Chine*, p. 199.

The gummy rice is named *no-mi*. It is probable that *no-mi*, as written by Mons. de Montigny, is not exactly the name of the plant, and that *tong-loh* is the green substance obtained from the berries of the *lo-chou*.

In 1848, according to Mons. Matthieu Plessy, Mons. Dan. Kæchlin Schouch, of Mulhausen, one of our most distinguished manufacturers, noticed a new green in a Chinese calico. The Chamber of Commerce of Mulhausen only received the cloths I have mentioned above, in November, 1849, but the following explanation of this apparent discrepancy of dates, has been afforded me by Mons. J. Albert Schlumberger, President of the Chamber:—

“The Delegate of the Chamber to China, on his return from his Mission, in 1845, brought us amongst other things, some green and red-dyed stuffs, on which, and especially the green, numerous experiments were made by our chemists.

The first document that alludes to this green dye, is a letter addressed by the Chamber of Commerce of Mulhausen, on the 27th April, 1850, to the Minister of Trade, in which they beg of him to make enquiries in China,—“regarding the green colouring matter used as a base to dye the green of the samples, which have been ascertained by

analysis to be dyed with the same colouring matter, being a dye stuff of a peculiar nature and unknown in Europe.”

This question, the precision of which is remarkable, for it notices—1st, the green base secured by the same colouring matter, 2ndly, a green dye-stuff of a peculiar nature unknown in Europe. This question, I say, was prepared by the Chemical Committee of the Industrial Society of Mulhausen.

It appears by a recent declaration of the Presidents of the Chamber of Commerce, and of the Industrial Society of Mulhausen, that Mons. Daniel Kæchlin Schouch, was the first to notice the singular colour of the green calicos dyed in China. Even at that time experiments had proved to that learned chemist, that this green changed to orange by the protosalts of tin, and to violet by fermentation. The letter of the 27th April, 1850, was initiated by him.

Seventeen months afterwards, in September, 1851, Mons. Daniel Kæchlin sent to Mons. Persoz a sample of this green cloth, dotted with small violet spots, and the dyeing of which was still an enigma.

M. Persoz succeeded in procuring, thanks to the zeal of his friend Mr. P. J. Forbes, Consul of America at Canton, about a gramme of the colouring matter. The request was made at the end of November, 1851; the lac was in Paris by the end of March, 1852. Mons. Persoz gave a part of this already very small sample, to Mons. Kæchlin, to Mons. Guinon, of Lyons, and to Mons. Espinasson, of Rouen. The paper containing it was sent to me on the 4th May, by Mons. Persoz. It bore a Chinese inscription, traced on running characters next to illegible. It indicated neither the name, nor the origin, nor the mode of using; it bore merely the price of the sample: (*tse-kia-liang-youen*, the price of this is two dollars.)

On the 5th April, 1852, Mons. Legentil, President of the Chamber of Commerce of Paris, had written to the Minister for Foreign Affairs, begging to make enquiries in China, and

handed to him for transmission to our Minister in that country, a note which had been drawn up by Mons. Persoz (2nd April). "The Chinese," said he, "possess a blue colouring substance, that dyes in green mordants of alum and iron. This substance contains no indigo, nor any matter obtained from that colouring principle. It was considered desirable to ask—'By what process it was prepared, and whether lime or chalk were used?'"

Mons. Persoz presented to the Academy of Sciences, at its meeting of the 18th October, 1852, a note that was published in the *Report of its Proceedings*, Vol. XXXV, pp. 558 and 559.

Some days afterwards (26th October, 1852,) the Minister of Foreign Affairs forwarded to the Chamber of Commerce of Paris, a despatch from Mons. de Bourboulon, Minister in China, dated Macao, 21st August, 1852.

This document was to the effect that—"Mr. Forbes could only obtain in Canton a quarter of a catty of the lac required. It costs at Canton, 35 piastres per catty. It is asserted that it is obtained from a flower. There are in China two other methods of dyeing green: 1st, with the flowers of the *hoai-hoa* and indigo (this will be mentioned hereafter); 2nd, with indigo alone, (the cloth dyed indigo being first exposed to the action of frost, and then to the rays of the sun.)"

The communication by Mons. Persoz to the Academy of Sciences was not likely to pass unnoticed. M. Seringe, Professor of Botany at Lyons, brought it on the 10th November, 1853, to the notice of the Chamber of Commerce of Lyons. This body took the question into consideration at its meeting of the 25th November.

The Chamber did me the honor to write to me on the subject, on the 7th December. I was requested first to collect in the offices of the Minister of Commerce, and of the Chamber of Commerce of Paris, as also from Mons.,

Persoz, every fact that might assist in directing the further study and application of known results, and enlightening its enquiries; 2nd, to discover by what means the green dye might be obtained in sufficient quantities to admit of practical experiments on a more extensive scale. My answer was sent on the 12th December. The Chamber, which never shrinks from any expense when the arts of the town are in question, voted, at its meeting of the 16th, the purchase in China of about five kilogrammes, and the opening of a cash credit to the extent of 3,000 francs.

I commissioned my friend Mons. D. Remi, a French merchant at Shanghai, to effect this purchase, and the Chamber received, in October, 1853, 160 taels of *lo-kao*, at 1 piastre and 35 cents per tael. It was packed in 19 small boxes, and had been bought at Sou-tcheou-fou; the net weight was 5 kilogrammes 590. The cost, with charges, amounted to 2,158 francs, 55 cents. The price per kilogramme was therefore 386 francs.

Mons. Persoz, in the course of a journey to Lyons, before presenting his note to the Institute, had mentioned the green dye to Mons. Guinon; that gentleman, on the 24th September, 1852, requested Messrs. DesGrands to obtain some for him. This commission was forwarded to Messrs. Carvalho and Co., of Canton, and Mons. Guinon was in possession, in March, 1853, of 256 taels of *lo-kao* of the first quality, and of two taels of the 2nd quality, purchased in Canton in December, 1852, at the rate 3 piastres per tael for the best, and 2 piastres for the second. Mons. Guinon offered on the 14th March, to make over a portion of this to the Chamber of Commerce. The Chamber agreed to take two kilogrammes, and received them on the 14th April, at 533 francs per kilogramme, being the cost price.

At a later date the Chamber distributed the *lo-kao* gratuitously, in quantities of from 5 to 10 grammes to about fifty chemists, dyers, calico-printers, and painters.

The claims of Mons. D. Kæchlin, to the discovery of the green dye has been established in two publications of the Industrial Society of Mulhausen ; one is the report presented to a general meeting, held on the 28th December, by Mons. Daniel Dollfus, junior ; the 2nd being a note read at the meeting of the 31st August, 1853, by Mons. E. Mathieu Plessy.

It is desirable to mention the fact, and I have named my authority : Mons. Persoz has forwarded to me, as referring to this subject, the following extract from a letter addressed to him by Mons. D. Kæchlin, on the 31st May, 1857 :—"To tell you the truth, it was only on reading your letter that I remembered that Mons. Plessy had read a paper on the green dye while I was absent at the waters in August, 1853, a paper which I had never read, and I am free to admit that if it had been known to me, I should have altered the tenor of the portion relating to you."

Subsequent to the report of the *lo-kao* by the Chamber of Commerce, considerable quantities have been received at Lyons, in Paris, and in London ; it has become an article of trade, and its price is regulated according to the demand.

In foreign countries, it is, if I be rightly informed, in Holland that the *green dye* was first received after France. The Industrial Society of the Netherlands obtained it towards the end of 1853 from the Dutch Consul in China. The *lo-kao* which was in 1853 used by Messrs. Walter Crum and John Mercer in their experiments, was given them by Mons. Persoz.

II.

OF THE SEVERAL COLOURING MATTERS THAT HAVE BEEN MENTIONED AS IDENTICAL WITH THE LO-KAO.

The history of the *green dye of China* would be incomplete if I were not to give an account of the green substances of which botanists, travellers, and chemists have furnished

notices, and which have been considered identical with the *lo-kao*, without any present grounds to justify such a surmise; in fact it is necessary I should treat of these matters. Should these several substances prove to be green dyes differing from the *lo-kao*, it is desirable to indicate them with a view to further investigations; if any of them should prove to be the *green dye* itself, its history will have been enriched with new facts. Lastly, if it should be proved that they are not green dyes at all, it will be needless to devote any further attention to them.

1.—*The Tsai, of Cochin China, mentioned by Poivre, about 1750, and Father Horta in 1766.*

Peter Poivre, born at Lyons in August, 1719, is celebrated for the great services which he rendered to the French Company of India and the Isles of France and Bourbon. He naturalised in these islands the nutmeg tree, the clove tree, the sago palm, the bread-fruit tree, &c. Poivre went to Cochin-China in 1749, as Minister from France, had a warm reception from the Emperor, and was in a position to obtain accurate information. Here is what he has written in a small work, printed at Verdun in 1768, entitled: *Tracts of a Philosopher, or Observations on the Manners and Arts of Africa, Asia, and America.*

"They" (the Cochin-Chinese) "cultivate the cotton plant, the mulberry, pepper, the varnish plant, the areca palm, tea, indigo, saffron, and a plant peculiar to their country named *tsai*, which being fermented like the indigo, furnishes an abundance of green flowers, which of themselves yield an emerald green and persistent dye. This plant would be a valuable accession to our American colonies." (p. 95.)

This passage is to be found in page 70 of the edition of the year, and it is repeated in the *General History of China* 1785, Vol. XIII (supplementary volume edited by the Abbé Grosier) page 218, and in the *Description of China and of*

the States dependent on the Emperor; by the Marquis of Fortia d'Urban, 1840, Vol. III, p. 135.

Father Horta, says in 1766 :—

“The Tongkenese cultivate a plant named *tsai*, which, being steeped, furnishes a green flower, that yields a very strong emerald green dye. I believe this plant is only found in Tongkin and Cochin-China.”*—(*Lettres Edifiantes* 1781, Vol. XVI, p. 239.)

The word *tsai* is not Cochin-Chinese; it is a Chinese word that may be written in two ways;† under the first form, it signifies plant or herb, and the second, pot-herb or vegetable.

2.—*Dinh-xanh, of Cochin-China.*

Charpentier de Cossigny published in Paris, in the year VII, a book under the title of *Voyage to Canton, with Observations on the Voyage to China, of Lord Macartney and Citizen Van Braam, a sketch of the Arts of the Indians and Chinese.*

“The Cochin-Chinese,” says he, at p. 588, “possess a plant which they name *dina-xang*, very much like our balm, from which they obtain, by means of trituration in water, a green fecula,‡ with which they dye cloths in every possible shade of green. All my endeavours during the last thirty years, to obtain the seed of this plant have been fruitless.”

The same writer again mentions this plant, and its dyeing fecula, at pp. 224 and 232 of the work mentioned above, at page 270 of the second volume of his *Voyage to Bengal*, and at page 353, of Vol. II., *On the means of improving the Colonies.*

* The use of the exact words of Poivre by Father Horta would lead to the very fair inference that he was repeating what Poivre had written before.—TRANS.

† Mons. Rondot gives the Chinese characters which our Calcutta printers have not the means of reproducing.—EDRS. JOURN.

‡ The extractive portions, yellow often, are combined in such proportions and quantity that they can easily be separated.—Cossigny, *Means of Improvement*, Vol. II, p. 353.

Peter Blancard, who for many years navigated the Indian seas, also mentions the *dina-xang* in his *Manual of the Trade of India*.

“The low lands (of Cochin-China) produce . . . a plant of great value, unknown in Europe, which would of itself enrich a whole colony: it is known by the name *dina-xang*: it yields, by fermentation, a green dye fecula used in dyeing cloths green of all shades; the Europeans call the plant *Green Indigo*” (p. 345).

Blancard never was in Cochin-China; he knew Charpentier de Cossigny (p. 344), and most likely obtained from him the little he knew of this green fecula.

I bought Blancard's works at the sale of the late Mr. Borel at Batavia. Borel had been several times to Cochin-China; he had moreover lived in the country for more than twelve years, and was the Agent at Batavia for the Emperor Annamite; and wrote the word *fable* at the end of the passage I have quoted.

I was myself at Touranne, in Cochin-China in the month of June, 1845; Monseigneur Lefevre, Bishop of Isauropolis, Vicar-Apostolic of Lower Cochin-China, who had just been rescued by the frigate *Alcmène*, and been conveyed to Macao, added some notes to the copy of the book commented on by Borel. He saw the remark about the green dye yielding plant, and differed from him in opinion. He was acquainted with a green dye.

I learnt from one of my Cochin-Chinese interpreters at Touranne, that there is a plant which does yield a kind of indigo, dyeing both silk and cotton green, that it grows in the Provinces of Quang-nam and Quang-duc, especially in the latter in the vicinity of Houé-fo. I could obtain neither the plant nor its product. Mons. Itier also mentions it. Mons. Hedde even names the price at which it was to be bought at Touranne, namely one quan and half the pound. As at that time (June, 1845) four quans were equal to

one pillar dollar, the cost was about 3 fr. 60 c. per kilogramme.

The fecula of the *dina-xang* may possibly be the same as that of the *tsai* mentioned by Poivre and Father Horta, and as the indigo indicated by Messrs. Heddes, Itier and myself.

I ought to state that J. de Loureiro, Monseigneur Pigneaux and Monseigneur Taberd, do not allude, the first in the *Flora Cochinchinensis*, the two others in the *Dictionarium Anamitico Latinum*, to any plant of the name of *dina-xang*. It is more correct to write *dinh-xanh*, and I mention that *xanh* signifies green. Thirteen Cochinchinese characters can nearly all be pronounced *dinh*, and I cannot therefore say which in particular is given to this plant.

Charpentier de Cossigny devoted much of his attention to indigo in India, in Mauritius, and in France; he was particularly interested in the green indigo, and made many experiments in this new direction. He presented a memoir to the Directory on the extraction of indigo from the woad, and he has alluded, without naming it, to a plant in Europe yielding a green fecula (*Voyage to Canton*, p. 292.) He no doubt means the blue flowered Scabious, used in Sweden to dye woollens green. I may nevertheless draw attention to a singular coincidence. The *dinh-xanh* is not unlike our balm, according to Charpentier de Cossigny, and Buchoz states in his *Treatise on Plants useful in Dyeing and Painting*, that the leaves of *Melissa officinalis*, Linn., yield, under the action of spirits of wine, a permanent green dye (p. 131). Mons. Persoz draws attention to the probability that the vague designation of de Cossigny was perhaps more applicable to *Mercurialis perennis*, which yields a permanent blue green, distinguished by the presence of indigo.

3.—*Green Indigo, prepared by Charpentier de Cossigny, in 1779.*

After noticing the *dina-xang*, Charpentier de Cossigny announced "that the indigo plant (*Indigofera tinctoria*), also

yielded a green fecula when boiled by a process differing from that followed by the indigo-factors to obtain the blue."

He enlarged on the subject in a letter addressed by him on the 12th September, 1779, "to LeMonniers, Member of the Academy of Sciences; it was printed after the *Essay on the Manufacture of Indigo*. I have found some details in *The Means for Improving the Colonies* (Vol. II., pp. 233 to 236):—

"The processes for obtaining it, (green indigo) are very simple. Heap up the fresh leaves of the plant; moisten them with a little pure water, or limewater for an hour; press them; separate the water that will flow from them, which must be filtered two or three times through a thick cloth; add more water to the mass of leaves, so as to wet them thoroughly, and then submit them again to pressure for an hour. Filter the second liquid for several times. The two liquids thus obtained may be mixed or kept separate. I noticed that the first yielded a brighter color than the second

"Add a considerable quantity of limewater to the liquids; stir them, then allow them to stand, and pour off the water. The residue will be found to be a fecula of a fine green.

"This must be washed several times in limewater, and then several times successively in boiling water.

"The indigo plant yields a larger quantity of green than of blue deposit.

"The green parts thus obtained is, like indigo, indissoluble in water; it does not even mix with it, though it seems to be somewhat more viscous. When fresh and damp, it tinges paper and cloth a deep permanent green; when dry it is black. The paste is very fine, but without lustre, it takes a polish, without assuming any colour or coppery shade, when rubbed with the nail.

"A still more elegant result is obtained, by using the leaves only, instead of the leaves with the stems.

"The indissolubility of the green indigo in watery, spirituous, acid, or alkaline menstrua, requires that it should be treated in the same manner as indigo colour to be used for painting. Fermentation might decompose it, and induce a change of colour."

4.—*Kim-long-Nhuom of Cochín-China.*

Noticed by J. E. Lourcero about 1780.

It is probable that the *tsai* of Poivre and the *dinh-xanh* of Charpentier de Cossigny are one and the same plant; the resemblance to balm leads to the supposition, as already stated, that the Cochín-Chinese plant belongs to the genus *Melissa*, or is identical with *Mercurialis perennis*. Such, however, is not the opinion of Correa, who thinks that the *tsai* of Poivre is the *Justicia tinctoria*.

This Acanthanous plant is certainly indigenous in Cochín-China. Louriero (Vol. I, p. 25,) alludes to its applicability as a dye: "*Folia viridi colore saturata, eodem telas pulchre imbuunt.*" Messrs. Pigneaux and Taberd, agree with Louriero in this account of its properties, and as to the Cochín-Chinese name of *Kim-long-Nhuom*. The *Justicia tinctoria* of Lour. and Roxb. is the *Peristrophe tinctoria* of Nees.

5.—*Cay-boung-boung, and the Cham-lon-la, of Cochín-China.*

Noticed by J. de Lourcero, about 1780.

More Cochín-Chinese plants whose beans yield a green color.

The *Cay-boung-boung* serving Louriero as a type for his genus *Aletris*, has been named by him *A. Cochín-Chinensis* (Vol. I. p. 204), it is the *Sansevieria late-virens* of Haworth. It is mentioned by this name in the *Hortus floridus Cocin-cinæ*.

According to Lopreiro (Vol. II, p. 484) a blue and a green colour is obtained from the pounded leaves of the *Cham-lon-la* (*Optimam tincturam cæruleam, viridemque.*) He adds that

this colouring matter is also obtained from the indigo plant, and that the produce of the latter is equally brilliant. The *Cham-lon-la* is the *Spilanthus tinctorius*, Lour., or *Adenostemma tinctorium*, Cassini, and I am induced to believe that it is one of the species of *lan* which the Chinese cultivate in their Southern Provinces, and which they ordinarily use to dye a light blue.

6.—*The Green Indigo of India.*

Announced by Prinsep, about 1790.

Alderman Prinsep, on his return from India, gave to Bancroft about 1790, a small piece of a hard green substance, produced in India, and which he called *Green Indigo*.

Bancroft has recorded in Volume I of *Experimental Researches concerning the Philosophy of Permanent Colours*, (London, 1813) pp. 264 to 266, the experiments to which he submitted this substance. It appeared to him to resemble, in certain points, the green fecula obtained from several plants, and especially of the *Cruciferae*, when exposed to fermentation in hot water, in the same manner as Indigo.

Bancroft had an idea that this green indigo of Prinsep was the fecula of the *tsai* mentioned by Poivre.

Here is the opinion of Mous. Persoz on the subject:—“Bancroft, being anxious to ascertain whether the substance handed to him by Prinsep was a *green fecula* that could be used to dye in green, states that having submitted it successively to the action of alcohol, water, concentrated sulphuric acid, and finally of a mixture of red arsenic and caustic alkali, after obtaining by means of alcohol, a considerable proportion of a green substance which he compares to chlorophylle, the insoluble residuum bore all the character of indigo. Treating it subsequently with sulphuric acid, he obtained the *Saxon blue*, while with sulphate of arsenic and alkali, he obtained a painting blue.” (Private letter, 4th June, 1857.)

7.—*The Green Barasat of India.*

Forwarded by R. C. Birch in 1792.

The green *barasat* was sent, in 1793, from Calcutta by Mr. R. C. Birch to Messrs. T. and F. Baring and Co., and these gentlemen requested Dr. Bancroft to examine it.

The *barasat* resembled indigo, but was of a deep green colour. It was reported to be the produce of the leaves of a perennial, exotic plant, thus described:—Leaves differing but slightly from those of the laurel; flowers small, yellow and arranged in clusters; the seeds arranged at the end of lengthy pods. This plant is, according to Bancroft, (Vol. I, p. 275) the *taroum akkar* of Marsden, which Roxburgh has described under the name of *Asclepias tinctoria*.

Birch announced that the green *barasat* imparted to silk and cloth a light green without any mordant. Bancroft came to the conclusion (after experiments) that this substance consisted of two different colouring matters; one insoluble in caustic potash, being in fact indigo; the other, olive, soluble in potash, imparting an olive and an apple green, when used as a dye. (See Bancroft, *Experimental Researches*, Vol. I., pp. 266 to 275). What Bancroft says of the *barasat*, is to a certain point, applicable to the woad. The olive green matter reminds me of the green fecula of the woad which consists of chlorophylle, a waxy matter, indigotine, and an azotized substance.

Mons. Persoz thinks the *barasat* is nothing but an impure kind of indigo. He thus writes to me on the subject: "This substance was submitted by Bancroft to numberless experiments, which ended in inducing him to believe that not only might he obtain from it all that was obtainable from indigo, but that by evaporating a portion previously reduced to powder, the result gave him pure crystals of indigotine."

If the green *barasat* is furnished as stated by Bancroft (Vol. I, p. 275) by the *Asclepias tinctoria*, Roxb., it is clear it can be nothing but an impure indigo.

Indeed the *Asclepias tinctoria*, Roxb. is very generally used as a blue dye in several parts of India, and of the Indian Archipelago, especially in Pegu and Sumatra; it is the *Masdenia tinctoria* of Robert Brown, the *Pergularia tinctoria* of Sprengel.

Marsden informs us that the *taroum akkar* contains indigo, and that it is used in Sumatra as also the *taroum (Indigofera)* for dyeing blue (*History of Sumatra*, 1783, p. 78). Roxburgh extracted from the leaves, by means of hot water, a quantity of indigo, considerably stronger, in his opinion, than that obtained from the *Indigofera tinctoria* (*Fl. Indica*, 1832, Vol. II, p. 44.) Bancroft himself alludes (Vol. I, p. 189,) to three kinds of this kind, prepared by Dr. Roxburgh; the first of a very beautiful violet; the second, approaching to blue, and the third approaching to purple.

8.—*Asclepias tingens* of the Burman Empire.

Mentioned by Dr. Buchanan about 1795.

Dr. Buchanan brought from Pegu to India, in 1795, the *Asclepias tingens*, Roxb. (*Gymnema tingens*,) Sprengel. He informed Dr. Roxburgh that the Burmans extracted a green colour from the leaves. The numerous and varied experiments made by Dr. Roxburgh resulted in disappointment. See *Fl. Indica*, Vol. II, p. 54, and *Bancroft*, Vol. I, pp. 275—276.

9.—*The Green Indigo*.

Examined by Kurer, in 1801.

I have not been successful in obtaining the original paper of Kurer, and therefore know it only by an abstract thereof prepared by Mons. Gustave Schwartz.

The experiments are nearly the same as those of Bancroft, though Kurer was not acquainted with the work of the latter, which was translated into German at a much later period. He came to the conclusion, that the green indigo in its deoxidized condition, was possessed of the same properties as the indigo of commerce, and that it is only a mixture of blue and of yellow substance from the plant.

10.—*Vegetable Green of China or Java.*

Sent by M. Cezard in 1837.

Mons. Nicholas Cezard, one of our most enterprising enquirers, sent, in 1837, from Batavia, to the Industrial Society of Mulhausen a vegetable green, with the simple observation that it was used in China as a dye-stuff. Mons. Gustave Schwartz was requested to examine its qualities and uses; the report read by him to the Society on the 27th September, 1837, is to be found in Vol. XI of the *Bulletin of the Industrial Society*, 1838, pp. 25 to 32.

Mons. Schwartz hesitates not to say, and his experiments support his assertion, that the vegetable green, sent by M. Cezard, was the same substance that had been previously examined by Bancroft and Kurer. He ascertained that it contained no green principle: that the green, or more properly olive green colour, was the result of the mixture of a yellow substance soluble in water, of gluten brown indigo, and blue indigo. The analysis of Mons. Schwartz yielded the following results:—

Yellow substance,	10.4
Gluten and salts,	35.3
Brown indigo,	39.2
Mucilaginous matter,	5.1
Indigo blue,	10.0
	<hr/>
	100.0

Professor Bleekrode received from Java, towards the end of 1856, a blueish green substance, believed to be the same as the *lo-kao*, but which his analysis proved to be analogous to indigo.

11.—The *Whi-mei of China.*

Exhibited in London, in 1851.

Before the *Green Dye of China*, had been discovered, before it was known or thought of, it is believed the plant

yielding it was exhibited in London by the East India Company. It is thus noticed in the official illustrated catalogue :—"The *whi-mei* of the Chinese, which is said to yield a green dye, and is produced in the Province of Chantoung" (Part V. p. 14, 20.) It attracted no attention, nevertheless Professor Solly, the reporter of Cl. IV, raises no doubt on the subject; he repeats that samples of the *whi-mei*, a green dye, were exhibited. (*Rep.*, p. 91.)

It would not be surprising to find that this *whi-mei* was either the green lac itself, or the bark of the *Rhamnus*, for the Rev. Mr. Edkins mentions that the *lo-kao*, is sent from Kia-ning-fou into the Province of Chantoung, and Father Helot asserts that the *pe-pi-lo-chou*, one of the two *Rhamni* which, it is said, do only furnish the green dye, is indigenous to the mountains of Chantoung. But Mr. Robert Fortune informs us, in a recently published work, that the *whi-mei* is the *Sophora Japonica*. He says, that, "Some persons have sent the flowers of the *whi-mei* (*Sophora Japonica*) to England, as yielding the green dye; but that flower yields a yellow dye, and even if mixed with blue to produce a green, that green would not be the one alluded to by French manufacturers." (p. 166.) This observation is quite correct. It is however, not certain, as I shall show further on, that the colouring matter of the flowering buds of the *S. Japonica* does not afford a green dye. The Chinese dyers, traders, and writers always call them *hoai-hoa*.

12.—*Green Substances sent in 1855, by the Agri-Horticultural Society of India.*

The Memo. presented by Mons. Persoz to the Academy of Sciences, attracted the attention of the Agri-Horticultural Society of India, holding its sittings in Calcutta. That body requested Mr. R. Fortune, then travelling in China, to collect and forward every information regarding the plant yielding the *lo-kao*. Mr. Fortune hastened to send seeds of the plant to the Society, who received them in 1854.

The Chamber of Commerce of Lyons reprinted the report of Mr. McMurray on the plan adopted by him for the cultivation of the two species obtained from China. This report is to be found at pp. 19 to 22 of this *Journal* for 1857.

Mr. R. Fortune forwarded further information regarding these plants, and the green dye to the Agri-Horticultural Society of India, in letters dated respectively from the Temple of Tein-tung, 30th June, 1854, from Hong-Kong, 19th March, 1855, and in 1873. The two first letters were also published by the Chamber of Commerce of Lyons (pp. 16 to 19). The third relates to information collected by the Rev. Mr. Edkins in Tche-kiang, and supplied by him to Dr. Lockhart (pp. 37 to 39.)

It is to be observed that Mr. R. Fortune did not see the *lo-kuo* prepared. He sent to the Society:—

1st.—Seeds of the cultivated, and of the wild species.

2nd.—Cuttings of the barks bought by Mr. Edkins in the district of Kia-hing.

3rd.—An extract obtained at Shang-hai by Dr. Lockhart, by boiling the cuttings.

4th.—An extract of the seed of the wild species.

5th.—Do. of the cultivated, do.

6th.—An extract from a mixture of the seeds of the wild and cultivated species. (I should mention that Mr. Fortune wrote:) “The extract of the seed of the cultivated plant is of a yellowish colour; while that of the wild kind is of a purple or violet tinge, and very beautiful. These two extracts mixed together yield a green of different shades, according to the proportions of each.”

7th.—Some paper dyed with the colouring matter extracted from both species, bought at Ning-po.

8th.—Some cloth dyed with the colouring matter obtained from the root, and bought in a town of Tche-kiang.

The Indian Agri-Horticultural Society forwarded the whole of the above samples to Mons. Persoz, in May, 1855,

and begged that learned chemist to examine them and favor the Society with his opinion. Mons. Persoz wrote to me as follows on the 4th June, 1857 :—" I went myself to London to receive these articles ; and on my return devoted myself in submitting every one of them to numerous experiments, in the hope that I had before me the organs and the extracts of the plant yielding the *green dye of China*. But great was my disappointment to find that, with the exception of the calico stated to be dyed green by the root, and which was identical with that forwarded in 1848 by Mons. de Montigny, none of those substances, not even the coloured paper, contained any of the green dye. All my attempts to elicit this dye were fruitless, you will therefore understand, my dear colleague, how much it was to be regretted that the *root* said to have been used in dyeing the calico with the genuine colour, was just the only substance that was not sent to us."

13.—*The Green Dye exhibited in Paris, in 1855.*

Dr. Forbes Røyle devoted a few lines to the green dye of China in the report which he addressed to the President of the Board of Trade, after the Universal Exhibition of Paris in 1855. There are, according to him, three kinds of *green dye of China*, or Green Indigo ; the first comes from China, the second from the Burman Empire, and the third from Assam. According to the same writer they are all obtained from Acanthaceous plants. The latter kind have been exhibited, in the Indian department, by Dr. Falconer ; it is noticed in the Jury report, with the note appended, that the green dye called in India *roum*, and the *green dye of China*, are the same substances.

A clever druggist of London, Mr. Daniel Hanbury, well known for his enquiries into the *Materia medica* of Asia, undertook to obtain information for me regarding this substance, of which I could not get any specimen, and the answer of Dr. Falconer leaves no doubt that the *roum* differs materially from the *green dye of China*.

“This green colour, named *roum* by the natives of Assam, is prepared in the valley of the Berhampooter river in Assam. It is extracted from a species of *Ruellia*, an Acanthaceous plant. This plant, the specific name of which is unknown, or a species nearly allied to it, is cultivated with the same object in Pegu, and other parts of the Burman Empire. We must not compare the *roum* with the *lilaroum*, an indigo furnished by an Apocynaceous plant, the *Wrightia tinctoria*, R. Br. Dr. Falconer is inclined to think that the green dye or *roum* of Assam contains indigo of the same kind as is yielded by the species of *Isatis* and *Wrightia*.

Some persons think this is the *Ruellia comosa*, Wall., or the *R. eucoma*, Steudel. Nothing definite can be said on this point. The *R. comosa*, Wall., is the *Ebermaiera axillaris*, De C., and the *R. comosa*, Roxb., or *R. eucoma* Steudel, is the *Butera ulnifolia*, De C. Both these plants are Acanthaceous, as well as the *Justicia tinctoria* of Loureiro mentioned above.

ABSTRACT.

Of these thirteen substances five have been examined, the others have not, and some of these are altogether unknown.

The green indigo of Prinsep, that analyzed by Kurer, the vegetable green of Mons. Cezard, are impure indigoes, possibly the same may be said of the *roum* of Assam.

The extracts sent by the Agri-Horticultural Society of India have none of the properties of the *lo-kao*.

With reference to the remark of Mr. Robert Fortune, the *whi-mei* exhibited in 1851, is either the flower of the *Sophora Japonica*, L., or a dye obtained from them. If this dye be really green, as stated in the Catalogue of Prof. Solly, it would support the singular assertion that the *hoai-hoa* may also yield a green colour, but the *whi-mei* is certainly not connected with the *lo-kao*.

The green dyes obtained from that species of *Ruellia* in Assam, from the *Justicia tinctoria*, Lour., the *Adenostemma*

tinctorium, Cass., the *Sansevieria late-virens*, Haw., the *Asclepias tingens*, Roxb., of the *Melissa officinalis*, L., of the blue flowered Scabious, have not yet been examined.

Finally the *tsai* of Poivre, the *dinh-xanh* of Charpentier de Cossigny, and the green indigo mentioned, in Cochinchina, to Mons. Hedde and myself, are still unknown.

The *green dye of China* has been sought in vain in the various plants stated to yield a green dye by several writers; the result does not appear to have been satisfactory. The plants I allude to are the *Arundo phragmites*, L., the artichoke, the deadly night-shade, wild chervil, the ash tree, *lucerne*, *Lycopersicum esculentum*, Mill., *Mercurialis perennis*, L., *Ronabea arborea*, Blanco, the groundsel and the common field clover.

III

OF THE CHINESE NAMES OF THE GREEN DYE, AND OF THE PLANTS FROM WHICH IT IS EXTRACTED.

Those only who have travelled and lived in China know how difficult it is to obtain precise information on any subject in that country; it is therefore not to be wondered at that after five years' expectation I am still without the names, written in Chinese characters, of the plants that yield the *green dye*, and no other person has been more fortunate than myself.

Mons. Arnaudtizon, a Delegate of the Chamber of Commerce of Rouen in China, wrote a letter regarding the *lo-kuo*, on the 16th January, 1853, to the French Consul at Shanghai. The date of that letter is interesting, and I have given an extract from it at the close of this notice. He states therein that the shrub is named *lo-sa*. Mons. de Montigny, Mons. Edan, his officiating successor, Mons. Remi, and Mr. Fortune, all give the same name (*lo-za*, *lok-zah*, *lo-sa*.) The Rev. Mr. Edkins, of Shanghai, is of the same

opinion ; but as he had the character before him, he wrote *luh-chae* in the Kouan-hoa dialect, and according to the English mode of transcribing Chinese words.

Lo-zai, loh-zah, lo-za or *lo-sa*, is not the name of a plant. The word *tchai*, in Kouan-hoa, and *zai* or *za*, in the dialect of Ningpo, means small faggot, or a faggot of small pieces of wood—small pieces of wood suited for burning. Father Helot assures us that :—

“The name of *lo-za*, given to this shrub in Tchakiang, is not its proper name, but the designation of its branches tied up in faggots for sale to the dyer.” (p. 24.)

Further on I shall speak of two species of two shrubs ; I do not exactly know the names by which they are distinguished in China. Father Helot is the only one who has thrown any light on this point. He mentions two species or two varieties of *lo-za* ; one is called *pa-bi lo-sa*, (white skinned green vine branch) the other *hom-bi lo-sa* (red skinned green vine branch).

Knowing the meaning, it is easy to restore the Chinese character ; the cultivated species would be in the Kouan-hoa dialect *pe-pi lo-tchai*, or more precisely *pe-pi lo-chou*, and the wild species, *hong-pi lo-tchai*, or still better *hong-pi lo-chou*.

Further on (p. 24) Father Helot says :—“The Cantonese on whose mountains this shrub grows, say it is called *lieu lo-chou* (willow green tree), and that at the commencement of winter it is conveyed in small faggots, and the name of *lieu lo-tché* (*tché* signifies small wood, branches). *Lieu lo-chou* is, therefore, I think its real name.” It is difficult to determine whether Father Helot meant to say that the *lieu lo-chou*, or more correctly the *lieou lo-chou*, is the generic name of the *Rhamni* that furnish the green dye or the name of that species of the genus that grows on the mountains of Changtoun, that is the *pe-pi lo-chou*. I incline to the first supposition.

Mr. Fortuue states that a farmer in the neighbourhood of Hong-tcheou-fou, who had some plantations of the cultivated *Rhamnus*, named it *loh-zah*, and *soh loh-shoo*. The cloth dyed with the bark was called *se lo-pou*, according to Father Helot, *soh lo-shoo* ought most probably to be written *se lo-chou*, and would then signify the *green-dye* tree, *se* (colour) being in Ning-po, pronounced *sah* and *soh*.

In a note to which I shall refer again, Mr. Ch. A. Sinclair, interpreter to the English consulate at Amoy, mentions a bark used in Fokien for dyeing cotton green; it is in the local dialect, called *hwuy chiang-chi*, or *lee-chi*.

I do not identify in these words the pronunciation peculiar to Fokien, and a search in the dictionary of that dialect lead me to believe they are not correct. To make sure, I asked Mr. Edgar Bowring, of the *Board of Trade*, to transcribe the letters as they appear in the original report of Mr. Sinclair. I found them to correspond with *hoa tchin-tse*, pronounced at Fokien *hoa tchim-tchi*, and *lo-se* pronounced *liok₂tchi*. The first signifies flower-needle thorn, that is the plant bearing sharp thorns and flowers; the second, green-thorn, or thorny plant yielding green. [It is almost needless to mention that the English vernacular name of the European *Rhamni* is buck-thorn.—TRANS.]

The shrubs from which the *green dye* is obtained are thorny; it is very probable that this *lo-tse* or *tchin-tse* is one of the *Rhamni* mentioned by Father Helot.

I have now to notice two names totally different from any of the above.

Father A. Aymeri, Procurator of the Mission of St. Lazarus in China, writes from *Ning-po* on the 22nd August, 1856, that a shrub, the bark of which is bought to dye for common cloths, and which grows wild in the district of Ht-tcheou is called *ma-ly*, in the province of Peking. He does not give the Chinese characters.

Dr. W. Williams mentions a plant named *ma-li-kin*, which should be the *Asclepias curassavica*, Lour. (*Toxicarpus Wightianus*, Hooker.) It has been stated above that indigo is extracted in Sumatra from the *A. tinctoria*, Roxb., and that in Pegu, the *A. tingens*, Roxb., yields a green dye.

I received from Mons. Remi, in September, 1856, a recent sample of the green dye of China, with a label, on which was written, "Green Paste of *Sou*." It differed in no respect from the previous despatches. Medhurst gives *clary* as the translation of *sou*, and Mons. Callery translated it *Scrophularia*. Mons. Decaisne told me that an English horticulturist had reared a scrophularious plant, which had been sent him as the *lo-za*.

Mons. Carvalho sent the 258 taels of lac intended for Mons. Guinon, under the name of *lok-kouh*. Messrs. De Montigny, Edan, Arnaudtizon, Remi, Father Helot and Aymeri, all call this substance *lo-kao*. The Rev. Mr. Edkins and Mons. Remi caused the character to be written, the first at Kia-hing-fou, the second at Shanghai; the name was not written in the same manner, but the difference was slight.

If we adopt the characters given by the Rev. Mr. Edkins, and Mons. Remi (letter of the 7th January, 1857,) the *green dye of China* is called *lo-kiao*, which signifies green glue, or green lac. Depending on the second writing, also sent me by Mons. Remi (Sept., 1856,) we have it green juice, green fat, green paste. I may add that it has also been written *lo-kao*, *lou-kao*, (*Travels of Morrison, Williams, &c.*) which explains how Mr. Edkins comes to write *luh-kaou*, and Mons. Remi *low-kou*. I give the pronunciation of Kouan-hoa; in Canton it is *louk-ko*, in Fokien, *liok-kou*, and *lek-ko*.

M. de Grijps, who forwarded from Amoy, to Dr. D. Hoffman, his former master, a Dutch translation of the paper of Father Helot, writes the equivalent to green cake, relying

on the opinion of Dr. Williams. I surmise the real name is *lo-kao*.

The *lo-kao* purchased at Canton in December, 1852, was divided into packets each containing 10 taels (378 gr.); these packets bore a label. It was supposed to convey some useful information, or at least the name of the lac and of the plant. Nothing of the kind. Here is the inscription:—

On the left: *Ting-chang, youen-tsai kiao tsoui-mao lo chiliang tso*, signifying “ten ounces (Chinese) exact weight, of fine green (colour) of feathers of the (bird) *tsoui*, natural colour of the best kind.”

On the right: *king-jen kien-siouen*, “selected with care to dye figured silks.” The name and sign of the seller are on the left: *Ta-sin tsai-yun*. —

IV.

OF THE PLANTS THAT YIELD THE GREEN DYE OF CHINA.

Until some European chemist shall have discovered traces of the green dye in some of the parts of the plants I am about to treat of, the flowers, the berries, the seeds, the leaves, the bark, or the root, it cannot be asserted that these plants are really those the Chinese use to dye their cottons with, or from which they prepare the *lo-kao*. The doubt is reasonable, when we consider the numerous contradictions that pervade the items of information collected in China by the most trustworthy persons, and how the most distinct assertions disagree with the facts ascertained by science and the arts. I repeat that in China one can only believe what one sees. A Chinese never confesses that he does not know; and he makes a point of producing any article required of him. He discourses on what he knows nothing of with the same effrontery with which he sells the Schweinfurt green as the green dye of China, and Prussian blue for indigo. The testimony of the Chinese can therefore only

be received after a careful examination, unless some dependence can, from previous experience, be placed in those from whom information is sought.

The discovery of the shrub that yields the green dye is due to Mons. de Montigny; it must have been made before the year 1852.

Mons. Decaisne found several specimens of the *Rhamnus chlorophorus* in the herbarium of Miss de Montigny. The branches bearing seeds not perfectly ripe must have been gathered in August or September, and as Mons. de Montigny embarked with his family at Whampoa for France in July, 1853, the shrub must have been in his possession during the later months of 1852.

I learn from Mons. Remi that Mons. de Montigny had several plants in the Consular Garden at Shanghai; but I cannot say when, but it must have been before 1853, and may have been in 1852, for Mons. Remi writes in terms that prove him to have seen what he writes about: "The *lo-za* grows somewhat rapidly, and attains in three years a height of from 5 to 6 feet."

Finally, before leaving China, Mons. de Montigny forwarded in cases to the Museum of Natural History, a number of plants of both species, which were unfortunately dead when they reached. Father Helot mentions them:—"The shrubs sent by Mons. de Montigny may be considered genuine, amongst the plants transmitted are the *hom-bi* and the *pa-bi lo-za*."

Whatever may be the date, Mons. de Montigny is the discoverer, and made these *Rhamni* known to Mr. Fortune. This priority need surprise no one: our Consul has rendered many other services, and his intelligent enquiries and indefatigable zeal are well known.

Mons. Persoz shewed me, in April, 1852, the vegetable green lac which he had just received; I immediately wrote to Canton for seeds of the plant from which it was obtained.

None were to be had. I wrote to Shanghai in October 1852.

On the 9th July, 1853, Mons. Remi wrote to me from Shanghai on the subject :—" I will speedily send you some seeds of the shrub that yields the green dye."—Mons. de Montigny had one of them in his garden ; he gave it to Mr. Alcock, British Consul. It is now covered with berries, when they are ripe I will ask Mr. Alcock for some. . . Mons. Edan assures me that there is another tree of the same genus, named *lo-za*, in the garden of Mons. de Montigny, of which he took possession with the Consular office. That tree is also loaded with berries."

Mons. Remi sent off the seeds on the 29th November, 1853. He wrote :—" Mons. Edan and myself have gathered these seeds, and we have extracted the green indigo of which we send you the extract." He adds further on :—" I believe the *lo-za* will grow rapidly in France ; and that large plantations would yield a profitable return to any undertaking the cultivation. The tree bears numerous branches ; it grows rapidly, and in three years attains a height of 5 or 6 feet. The berries are abundant ; a single tree will yield enough to make half a kilogramme of indigo."

Finally, Mons. Edan wrote on the 10th December, 1853—:

" I gave Mons. Remi a part of the gathering (of the berries of the *lo-za*) secured in my garden."

This is the history of the seeds I received in January, 1854. I gave a portion to my sister-in-law, Madame Bizot-Desgrand, of Lyons, and another portion to my friend Mons. de Montigny, who was then at Paris, and who presented them on the 13th April, 1855, to the Imperial Zoological Society of Acclimation. The Society handed the seeds to Mons. Paillet, but none of them germinated. The other seeds were sown, in February, 1854, at Tassin, near Lyons, by Mons. P. Desgrand ; they germinated, and some fifteen plants are still in existence, having weathered three winters. 6

The plants that have flowered this year at Irigny, with Mons. A. F. Michel, were obtained from Tassin, as also those in the Botanical Garden of Lyons.

Mons. Arnaudtizon considered (in January, 1853) that two species of *lo-chou* were in use. He says:—"The colouring matter is obtained from a tree of which there are two kinds, one produces what is called in Chinese the *yellow skin*; the other the *white skin*." He adds that this tree is only to be found near Sou-tchou and Kachin, in marshy land. The Rev. Mr. Edkins also indicates two species; one called a *white* variety, is wild, and grows in abundance in the vicinity of Kia-hing and Ning-po; the other, the yellow variety, is cultivated, and is to be found at Tsoh-kaou-pang, where some thirty men are employed in the preparation of the dye-stuff.

Mons. Fortune secured the wild and the cultivated species; he sent plants of both from China to the Agri-Horticultural Society of India, who received them in March, 1854; he subsequently brought both the same species to England.

Father Helot confirms the assertion, by saying: "The *lo-za* is of two kinds, which may be only varieties of the same species. One is from the bare mountains in the S. E. of Tché-kiang (in Chantoung) and named *pa-bi lo-za*; the other which is a shrub, and grows wild in the fertile plains around Azè, in the same Tché-kiang, is called *hom-bi lo-za*." When the bark of this latter species is boiled in water, a white scum is formed that subsequently passes to rose. "It is this peculiarity," says Father Helot, "that has obtained for it the name of *hom-bi*, red (scum) bark." However long the bark of the other may be boiled the same remains white; hence the name of *pa-bi*, white (scum) bark.

Father Helot does not agree in this respect with the Revd. William Edkins and Mons. Arnaudtizon. Red bark is said to be *hong-pi*; yellow bark *hoang-pi*, or as commonly

pronounced *houong-pi*; the difference between *hong-pi* and *houong-pi* is so small that it is easily accounted for. The *pe-pi lo-chou* is, according to Father Helot, the cultivated species, and the wild species according to Mr. Edkins. The same discrepancy exists between them in regard to the *hong-pi* or *houong-pi*. Mr. Fortune agrees with the English missionary.

Mons. Remi wrote to me on the 6th September, 1855; "There are certainly two kinds of *lo-za*, but I believe that only one, and that the one you possess, yields the green indigo." Mons. Remi explained more recently in August, 1856, that the name of *lo-za* is applied to two varieties, to the *male lo-za* and the *female lo-za*; that the barks of the two are mixed together to dye silk and cotton green.

Messrs. Arnaudtizon and Fortune, the Rev. Mr. Edkins, and Father Helot, also intimate that the two species are necessary to the production of the green dye. "The solution of *hom-bi lo-za*," says the latter, "yields a stronger and more firm tint, but without lustre, while the solution of the *pa-bi lo-za* affords a light tint without strength, but with a magnificent glance. The operation of preparing the colour commences with the *hom-bi*, and it is completed with the *pa-bi*, and thus do the Chinese make their most valuable colour."

If there be one fact beyond a doubt, it is that there are two species of *lo-chou*. It is established by learned persons who have seen them, and the remarks have been made at different times and different places. But these observations, when compared with each other, and with the remarks addressed to me by Sir W. J. Hooker, Dr. Lindley, Messrs. Fortune, Remi and Hانبury, exhibit contradictions, some of which have already been noticed.

With these reservations, I will now state how I came to collect facts sufficiently authentic to enable Mons. Decaisne of the Academy of Sciences, to describe these two species.

The illustrious Professor of the Jardin des Plantes has on the other hand, owing to the great care devoted by him to all his enquiries, arrived at proofs of a distinct and original character, that have confirmed my own.

Father Helot caused a branch of the *hong-pi lo-chou*, covered with green berries, to be drawn from nature by a Chinese artist; the Central Committee of the Society for the Propagation of the Faith communicated this water-colour to the Chamber of Commerce of Lyons; and its members committed it to my care. The authenticity of this drawing is incontestable; it bears the seal and signature of the artist *Lao-san, i-kien, tchi* (Lao-san, surnamed Kien, did it;) the plant is expressly stated to be the *hong-pi lo-chou*.

This was my starting point. I was so fortunate as to secure proofs of the accuracy of this painting.

Father Helot had made arrangements for sending fifty pounds of seed to the Central Committee. The despatch never reached its destination; but, in the month of January, 1857, Father Aymeri forwarded from Shanghai, to Mons. E. Tastet, a large quantity of black berries, which on account of their appearance, and the number of thorns mixed with them, were evidently the produce of this species. This despatch is probably that originally prepared by Father Helot.

I received myself from Shanghai, in April, 1857, similar berries accompanied as they were by thorns. Those painted by the Chinese artist resemble these thorns as to apparent strength, hardness, sharpness, and length.

Dr. W. Lockhart sent from Shanghai to Mr. Dan. Hanbury some branches said to be taken from the cultivated species of *lo-chou*: they belonged to that *Rhamnus* which Mr. Fortune also states to be cultivated, and of which he brought several plants to England. These plants are in the garden of Dr. Lindley at Acton-Green, and in that of Mr. Glendinning, nurseryman, of Turnham-Green.

Mons. Decaisne examined the leaves forwarded to me by Mr. Hanbury; they correspond with those of the *hong-pi lo-chou* drawn by Lao-san. Mons. Van Houtte, the celebrated horticulturist of Gand, has reared, on the other hand, a *Rhamnus* sent to him as the one yielding the green dye; and Mons. Decaisne has been able to declare that it differs, in no respect, from that of Father Helot.

The *hong-pi lo-chou* has all the characteristics of a wild shrub; and, of the two species, this one must be considered as the one growing without cultivation. This is the opinion of Mons. Decaisne; it is that of Father Helot; and we must believe that both Mr. Edkins and Mr. Fortune have been misled. With this reservation, their accounts agree with what we have said regarding this species. The *hong-pi lo-chou* is truly very strong and vigorous, as remarked by Mr. McMurray when writing of the cultivated species, and Mons. Persoz has obtained from the berries, as Mr. Fortune did, a fine yellow dye; but I am bound to notice that Father Helot, writing on the 27th April, 1857, on the subject of the *pe-pi lo-chou*, observes in a P. S.:—"This shrub is not cultivated," while he said in his paper on the *green dye*:—"The *hom-bi lo-sa* grows as a shrub and without cultivation." We shall shew hereafter which of these two is the correct definition.

Mons. Decaisne has, under the name of *Rhamnus utilis*, described this species, which is allied in the size of its leaves to the *R. hybridus* of our gardens (see pl. 1). .

"*Rhamnus dioicus*; ramulis cylindraceis, spines centibus vel inermibus; foliis 8-10 centim. longis, 3-4 latis, oppositis alternis ve, elliptico-oblongis, apice obtusis aut acuminatis, basi parum attenuatis, margine denticulatis et ciliolatis, subtus puberulis, penninerviis, nervis pagina superiore impressis, inferiore prominulis; baccis magnitudine pisi majoris; nuculis obovodeis, compressis, longitrorsum sulcatis, opacis."

The *hong-pi lo-chou* being known, it is evident that the other species sent us must be the *pe-pi lo-chou*. Mons. de Montigny possessed both species, he sent them both to the hot-houses of France, but they were found dead on arrival; there remained only in his garden, at Shanghai, that other species which was not the *hong-pi lo-chou*, the one which according to every testimony was necessary in the preparation of the green dye. It is merely called *lo-za* or *lo-chou*; it must certainly be the *pe-pi lo-chou* of Father Helot, and what he says on the subject in his letter of the 6th of April, 1857, decides the point.

I draw especial attention to the fact, stated by the Chinese, that to this shrub is due the most singular attribute of the green dye, viz., its brilliancy when exposed to artificial light. Father Helot speaks of the magnificent lustre obtained only after immersion in the infusion of the *pe-pi lo-chou*. At Azè he was assured that the *lo-kao* was prepared from the bark of the *pe-pi*, and the dyers of Khiutcheou-fou, whom this zealous missionary interrogated, described a process for dyeing silks and cotton with the *pe-pi* only. It would seem, in fact, if one might place any dependence on the somewhat obscure statements of the Chinese, that the *pe-pi* alone yields violet, blue and green, according to circumstances, and a peculiar kind of *lo-kao*, on cloth of a watery green tending to azure, with lime or alum; that the *hong-pi* yields a yellow to impart a green to the color, and that the *lo-kao* is impure if the admixture of this yellow be in too great a proportion.

I have introduced the *pe-pi lo-chou* into Europe. I twice received seeds of this plant. I gave some of the first despatch to Mons. de Montigny and to Madame Bizot Desgrand, and of the second to Mons. Decaisne, to Sir J. W. Hooker, and to the Messrs. A. F. Michel, Scringé, Paillet, Hanbury, Bleckrode and Van Houtte.

Mons. Remi had sent me, some short time before, a branch covered with unripe berries; a drawing was prepared from this branch, and fragments of it are still in existence. Subsequently, Mons. Mollien, French Consul at Havanna, on his return, in January or February, 1854, from a Journey to China, brought some specimens of the same *lo-chou*; they had been gathered carelessly, and were in a bad condition.

In the meantime, the seeds sown in Lyons in February, 1854, had germinated, and some twenty shrubs were growing in the open air, on a hill side, exposed to the wind. They all flowered in the early part of May, 1857. Mons. Decaisne described the species from a branch in flower gathered on the 19th May, by Mons. A. F. Michel, from the plant he had reared in April, 1856, at his country-house at Trigny, near Lyons. Mons. Decaisne not only examined the seeds of both despatches, the shrubs reared from those seeds, the branches sent in 1853 and 1854, but he found several excellent specimens in the herbarium of Mlle. Montigny. He could have no doubt on the subject.

In noticing as mentioned above, that Mr. Fortune must have been misinformed as to the distinction between the two species, I must observe that the remarks of Mr. McMurray, regarding the wild shrub, are applicable to the *pe-pi lo-chou*: it has smaller leaves, and a more delicate habit than the other. Mr. Fortune has extracted from the berries a purplish or violet dye of superior quality; it will be seen further on, that the fruit of the *lo-chou* in the garden of Mons. de Montigny (in Shanghai) yielded a very rich green substance to Messrs. Edan and Remi.

The *pe-pi lo-chou* is now the *Rhamnus chlorophorus* of Decaisne (see Pl. II.)

“*Rhamnus dioicus*; ramulis cylindraceis, cinereis, apice spinescentibus et pube brevi inspersis; foliis 3-4 centim. longis, 2-3 latis, alternis oppositisve, breviter petiolatis, ovatis, acuminatis, basi cuneatis, denticulatis, subtus pæberulis,

supra glabris, nervis in pagina superiore impressis, in inferiore prominulis; stipulis lineari-setaceis membranaceis; floribus masculis binis v. quaternis; calycis tubo infundibuliformi, laciniis lanceolato attenuatis, reflexis, vix puberulis; petalis obovatis, membranaceis, stamina longitudine subæquantibus; ovarii abortivi stylis binis obtusis; baccis nigris, globosis, magnitudine pisi minoris; nuculis obovoideo-rotundatis cylindraceisve, dimidio inferiore sulcatis, nitidis."

It may be remarked of these two new species of *Rhamnus*, and perhaps to others, that according to localities the extremity of the branch is thorny or otherwise, and that therefore characters deduced from the existence or absence of thorns are of very small consequence in describing species. The branches of the specimens of the herbarium of Mlle. Montigny are armed at their extremities with long hard and sharp thorns, while the thorns on the plants reared at Lyons are hardly noticeable.

Finally, it is established that the *hong-pi lo-chou*, (*Rhamnus utilis*), is, according to Father Helot, the wild species, and according to Messrs. Edkins and Fortune, the cultivated species; and the *pe-pi lo-chou* (*Rhamnus chlorophorus*), is the wild species of Messrs. Edkins and Fortune, and the cultivated plant of Father Helot.* The first has been introduced by Mr. Fortune, the second by myself.

The Chamber of Commerce of Lyons has inserted in its second publication a note addressed to them by me on the origin of the seeds of the *lo-chou* reared at Lyons. An error slipped into that note which I hasten to correct, at page 39, line 21, for *Rhamnus Sinensis* read *R. tinctorius*. There is no *R. Sinensis*. Mons. Decaisne expressed his belief on first examining it, that the branch belonged to a closely allied

* Dr. Lindley thought at first sight that the *hong-pi lo-chou* was the *R. cornifolius*, of Boissier and Hohenacher, but he has given up that opinion since the plant has been described by Mons. Decaisne; but he still believes that the *R. chlorophorus*, Deene, is identical with *R. globosus* of Bunge.

species, described by Waldstein and Kitaibel under the name of *Rhamnus tinctorius*, without being able to decide unless he saw the flowers whether it was a variety or a new species. I write now with the letters, written in 1854, by Mons. Decaisne, before me; subsequent facts have proved the correctness of his surmises. There is in the Jardin des Plantes a very handsome *R. tinctorius*, and it will be seen how much it resembles the *R. chlorophorus*, the latter differing only in the shape of the calyx.

M. Seringe has described the *hông-pi lo-chou*, from the drawing of Lao-san, under the name of *Rhamnus Sinensis*. I must bring to the recollection of my readers that it has been named *R. utilis* by Mons. Decaisne.

Are the two buck-thorns of which I have been writing, the only ones that yield the green dye? The Chinese declare that other species of the same genus have dyeing properties.

I do not mention various plants, known and unknown, which are asserted by some persons, without sufficient proof, to be the genuine *lo-chou*.

V.

OF THE LOCALITIES TO WHICH THE LO-CHOU IS INDIGENOUS.

Every thing leads to the belief, though it cannot be asserted, that our two buckthorns are those whose introduction is so very desirable. It is therefore proper to consider the climate most suitable to their cultivation.

The *houong-pi lo-chou* grows in the fertile plains in the neighbourhood of Azè, in the Tché-kiang (Father Hclot); the *houong-pi lo-chou* is found at *Tsou-kaou-pung* (Revd. Mr. Edkins); the *ma-li* is very common in the hills of the district of Hi-tcheou (Father Aymeri.) Those three localities refer to the wild species.

As for the cultivated species it abounds in the mountains of Khin-tcheou-fou, in those of the S. E. parts of Tchékiang

and of Chantoung (Father Helot); in the vicinity of Hang-tcheou-fou, of Kia-hing-fou, and of Ning-po (Revd. Mr. Edkins). Father Helot observes that the faggots of the *pe-pi lo-chou* are brought to Azè from a distance of upwards of 40 leagues, which does not agree with the assertions of Mr. Edkins, and of the dyers of Khin-tcheou-fou.

Others state that the *lo-chou* (without specifying the particular kind,) is found in the neighbourhood of Sou-tcheou-fou and of Kachin in the marshy lands (Mons. Arnaud-tizon); near Tcha-fou-pân (Mons. Edan), at Sou-tcheou and at Amoy (Mons. Carvalho), at a short distance from Sou-tcheou (Mons. Remi), and between Hang-tcheou-fou and Hou-tcheou-fou. Finally, the *lo-tsé* mentioned by Mr. Sinclair, grows in abundance at Tung-chun-chow in the Fokien province.

It is necessary to determine to which of the two species the *lo-tse* just mentioned belongs. The only hint supplied by the note of Mr. Sinclair is as to the price: he says large quantities of bark are purchaseable at 5000 sapeques the picul, or about 46 francs for 100 kilogrammes. This is precisely the price of the *pe-pi lo-chou*. At Azè the *hong-pi lo-chou*, made into faggots, is worth about $8\frac{1}{2}$ fr. per 100 kilogrammes; and the *pe-pi lo-chou* about $24\frac{3}{4}$ fr. As it is understood that 100lbs of faggots yield about 50lbs of bark, we must double the above prices, as the value of the bark, viz., 17 francs the 100 kilogrammes for the bark of the *hong-pi lo-chou*, and $49\frac{1}{2}$ francs for the *pe-pi lo-chou*. It is reasonable therefore, to suppose, that the latter is the shrub cultivated at Tungchun-chow.

But there is no district of this name in the province of Fo-kien nor in any part of China. It must therefore be an error of the press, and we must read Young-tchun-tcheou. This district is in the southern part of Fokien.

Thus the *pe-pi lo-chou*, or *Rhamnus chlorophorus*, is found to be cultivated between the 25th and 36th degrees of

North latitude, and more especially about the 30th and 31st degrees of North latitude.

The *hong-pi lo-chou*, or *Rhamnus utilis*, is mentioned as high as the 39th, and extends to the 30th degree of Northern latitude.

This buck-thorn seems, in fact, much stronger than the first, and to be able to resist the severe frosts of Tchi-li.

It is evident that both species exist in abundance in the Northern parts of the province of Tché-kiang, over a space of about 15 square leagues, of which I will define the limits. Barrow had observed on the banks of the Sihou lake, buckthorns mixed with roses, cotton plants, lilacs, junipers, &c.

Ning-po, chief town of the district of that name, in the province of Tché-kiang, one of the ports opened to foreign trade, is in N. lat. $29^{\circ} 55'$, and E. long. $119^{\circ} 6'$. Kia-hing-fou, also the chief town of a district, and in the same province, will be found in N. lat. $30^{\circ} 53'$ and E. long. $118^{\circ} 13'$. Tsoh-kaou-pang is distant two or three miles from Wang-tien, and that little town is some miles south of Kia-hing-fou, "It is in the neighbourhood of Tcha-fou-pan," writes Mons. Edan, "that the *lo-za* is most abundant," and, according to him, Tcha-fou-pan is a large borough, almost entirely inhabited by Christians, situate in the province of Tché-kiang, 70 leagues from Shanghai. There must be some error in specification of this distance, and if the Tcha-fou-pan of Mons. Edan be not the Tsoh-kaou-pang of Mr. Edkius, it must be close to it. Father Helot in alluding to a large assemblage of Christians in the neighbourhood of Azè no doubt intends to speak of this place. Azè, is a large township, six or eight leagues to the south of Kia-hing-fou, which would place it between the town of Hai-ning and Hai-yen, both of them chief places of districts, the first in N. lat. $30^{\circ} 28'$ and East long. $118^{\circ} 6'$, the second in N. lat. $30^{\circ} 35'$ and East long. $118^{\circ} 20'$. The correct name of Azè is

probably Hai-tsui. Hou-tchaou-fou is in N. Lat. $30^{\circ} 53'$ and E. long. $117^{\circ} 36'$, and Hang-tcheou-fou in N. lat. $30^{\circ} 20'$ and East Long. $117^{\circ} 48'$; both are chief towns of districts in the Province of Tché-kiang. Finally, Sou-tcheou-fou, chief town of a district in Kiang-sou, is in North lat. $31^{\circ} 23'$, and East long. $118^{\circ} 9'$.

This small tract is therefore confined within lat. $31^{\circ} 23'$, Northwards and $29^{\circ} 55'$ Southwards, and Long. $118^{\circ} 20'$ Eastward, and $117^{\circ} 36'$ Westward.

It is without doubt the most interesting district in China as far as Lyons is concerned. The most celebrated mulberry nurseries, the filatures, mills, and manufactories are to be found in these departments of Hang-tcheou and Hou-tcheou. The latter furnishes raw and organzin silk of the greatest value in the Empire, namely those of Nan-tsin or Hou, divisible into three classes well known at Lyons: the *tsi-li* or *tsat-lee*, the *yunc-hoa* or *yune-fa* (garden-flower) the *ta-tsan* or *tay-saam* (large silk-worms).

Here are the direct distances between Shanghai and each of the above towns. I calculate by *lis*, and 10 *lis* are equal to a league:—

From Shanghai	to Sou-tcheou-fou,	100	lis.
„	„ to Kia-hing-fou,	115	„
„	„ to Hai-ning-hien,	165	„
„	„ to Hou-tcheou-fou	190	„
„	„ to Ning-po-fo,	215	„
„	„ to Hang-tcheou-fou,	225.	„

Kia-hing-fou is 62 *lis* from Haining, and 145 *lis* from Ning-po. Hang-tcheou-fou is only 90 *lis* from Ning-po.

The climate of this most fertile part of the provinces of Tché-kiang and Kiang-sou assimilates with that of the south of France; the following are cultivated there:—the mulberry, the vine, the peach, the orange, the jujube, the almond, the plum, the camphor, ebony, hemp, sugar-cane,

wheat, rice, sesamum, tobacco,* &c. It is certain that the two species of *Rhamnus*, of which one can bear the climate of the latitude of Pekin, and the other is found in the mountains of Chantoung, would be perfectly at home in France.

VI.

THE OTHER SPECIES OF RHAMNUS THAT HAVE BEEN DISCOVERED IN CHINA.

The bark and the fruit of the buck-thorns have recently been the subject of much enquiry, and it will not be out of place to point out all the species that are indigenous to China. The number is small, and several will have to be referred to the genus *Zizyphus*.

Rhamnus crenatus, of Siebold and Zuccarini; Hab. Japan, (Hoffmann and Schultes. *Asiat Journ.* 4th Series, Vol. XX, p. 323.)

R. globosus, Bunge; North China.

R. lineatus, Lour. *Berchemia Loureiriana*, Decand; China. (Osbeck, *Voy. to China*, 1771, Vol. I, p. 353; fig. 7; Vol. II, p. 345,) Cochin-China (Lour. Vol. I, p. 159.)

R. theezans, Linn. *R. thea*, Osh., *Sagaretia theezans*, Br.; China (Osbeck, Vol. I. p. 375, and Vol. II, p. 245, *Account of China*, Vol. III, p. 355.)

R. agrestis, Lour., *Zizyphus agrestis*, Schultes; Cochin-China (Lour. Vol. I, p. 158; *Dict. Anam.* Latin, p. 633.)

R. ænoplia, Linn., *Zizyphus ænoplia*, Miller; China. (Osbeck, Vol. I, p. 386, and Vol. II p. 345.)

R. Soporifer, Lour. *Zizyphus soporifera*, Schultes; China. (Lour. Vol. I, p. 158, *Account of China*, Vol. III, p. 355.)

To this list have to be added:

* All, with two exceptions, cultivated in the more temperate parts of the Punjab.—TRANS.

Rhamnus utilis, Decne. ; *R. chlorophorus*, Decne. ; a new species allied to *R. chlorophorus*, in the herbarium of Mlde. de Montigny (*R. bapticus*, Decne.)

Lastly, Plukenet describes three buck-thorns, indigenous, one to the island of Tow-whey-san, and the other *R. Cheusanensis*, of the island of Tchou-san, which, in his opinion, somewhat resemble the *R. catharticus* of Linn., the third is the *R. sinensis flore cœruleo*, of the island of Tchou-san (*Amalthœum bclanicum*, 1705, p. 182. pl. 408, figs. 2 and 4. p. 183.)

VII.

OF THE PARTS OF THE LO-CHOU THAT YIELD THE GREEN DYE.

It is still not positively known whether the *Lo-kao* is obtained from the bark, the fruit, or the root ; nevertheless we have much reason to believe that it is extracted from the bark of the branches, and no doubt also from the bark of the roots.

Flowers and Leaves.

Mons. de Bourboulon wrote from Macao on the 21st August, 1852, to the Minister of Foreign Affairs :—"The Chinese who obtained this lac for Mr. Forbes, assured him that it was the produce of the flower." Mons. Carvalho, of Canton (26th November, 1852), says :—"This dye-stuff, extracted from the flower and the leaf of a certain shrub, comes from Amoy and Sou-tchou-fou in very small quantities." Information to the same effect was given to the Commercial Delegates at Canton.

Roots.

The Agri-Horticultural Society of India sent to Mons. Persoz a sample of Chinese green cloth, "dyed with the colouring matter obtained (according to the Society) from the root." Mons. Persoz ascertained that this cloth did derive its colour from the *Green Dye*.

Bark.

According to Mons. Arnaudtizon, the bath employed to dye dark green, is a hot infusion (in lime water) of the peeled bark. The Rev. Mr. Edkins collected information at Kia-hing-fou. He says: "The barks of the two species are thrown together into iron kettles full of water; it is boiled for some time; the decoction is allowed to settle for three days; it is then poured into large vessels, and the cotton cloths, previously saturated in lime water, are then repeatedly dipped."

Father Helot has in his Memoir recorded these several details of the operation. At Azè the bark of both kinds are used, but they are not mixed. "The dyeing of cloth is effected by dipping it from seven to ten times in the solution of the *hom-bi*, and the work is completed by three immersions in the solution of the *pa-bi*, drying the cloth every time." The object is that of securing *lo-kao*. At Khin-tcheou-fou, it appearst hat cloth is dyed by means of the *pe-pi lo-chou* only.

Father Aymeri, writing of the process in use at Tchi-li and Mons. Sinclair describing its nature at Amoy, only mention the bark, and Mr. Fortune wrote to Calcutta:—"It is a first step to have obtained the plant; a second to know that the dye is obtained from the bark."

The Fruit.

"The green colour is not made from the seed, which is a small black berry, but if crushed on some white paper, it stains it green. At Azè, the seed is not used at all." (Father Helot). "The seeds of the *lo-za* are of no use." (Ibid, letter 6th April, 1857.)

The following is the opinion of Mons. Edan:—"The fruit or berry (of the *lo-za*) in which the seed is enclosed, affords the precious indigo used by the Chinese to dye their cloths a fine sea-green colour." (10th December, 1853.)

About the same time (the 29th November, 1853) Mons. Remi wrote to me as follows:—"They told us (Mons. de

Montigny and himself) that the green indigo was extracted from the bark of the tree, while in truth it is obtained from the small fruit of the tree resembling the fruit of the wild vine. Mons. Edan and myself have gathered this fruit, and have extracted the green indigo, of which I send you a sample."

I should state how Mons. Edan and Remi prepared this substance, that appeared to them "a magnificent green." They first removed the skin and the seed of the berry; the fruit was then pressed to obtain its juice; this was boiled to concentration. Mons. Remi adds:—"The Chinese, after having boiled the juice, spread the paste thus obtained on some paper, and expose it to the sun to dry."

The subjoined extract from a letter of Mons. Remi dated, the 14th March, 1854, is not less interesting:—"Mons. Edan and myself obtained a very fine green from the fruit of the *lo-za*; but were unsuccessful in regard to the bark we have therefore been induced to think that the sole mode of preparation of the green dye from the fruit is the only practicable one. But Mons. Edan has recently seen the celebrated English naturalist, Mr. Fortune, to whom Mons. de Montigny had mentioned the qualities of this plant, and who had obtained from the Chinese in the interior certain information that corresponded with that originally furnished: Mons. Edan took advantage of the visit of Mr. Fortune to express his doubts of the real origin of the green indigo. Mr. Fortune assured him that the bark of the *lo-za* was truly employed to furnish the stuff with which to dye cloth green, but that the fruit was used in the preparation of a green paint.

Mons. Remi writes again on the 6th September, 1855:—"The bark of the male and of the female *lo-za* yield the true green for the dying of textures, and the fruit affords the green colour that is used for painting both in oil and water colours."

“The Chinese, according to Mr. Fortune, were agreed in telling him that the seeds were used for staining paper only, and silk and cotton stuffs were dyed with the bark.” Lastly, according to a memorandum received from China by Messrs. Chartron, father and son, and Monnier, of Lyons, and which they communicated to the Chamber of Commerce, the best kind of *lo-kao* is made from the berry, and the inferior kind from the leaf or the bark.

All the experiments made to this day, with the bark and the leaves of the *Rhamnus chlorophorus*, and the fruit of the *R. utilis*, have not been decisive.

Mons. Persoz has extracted a yellow dye from the bark of the *Rhamnus chlorophorus*, and the berries of the *R. utilis*. I do not know the result of the experiments of Mons. Barreswil on the green matter extracted at Shanghai from the fruit of the *R. chlorophorus* by Messrs. Edan and Remi. It will have been noticed above that Mons. Persoz could not discover a trace of the green dye in the extracts prepared from the berries of both kinds, and sent to him by the Agri-Horticultural Society of India.

If we are to receive the united testimony of Fathers Helot and Aymeri, Messrs. Arnaudtizon, Edkins, Fortune and Remi, we must believe it is the bark of the *Rhamnus chlorophorus* and *utilis*, but especially of the former, that gives to the green dye that brilliant colour it assumes under the influence of artificial light. The fruit, at least that of *R. chlorophorus*, probably yields a green colouring matter, analogous to the bladder-green, and differing from the true green dye both in colour and properties.

The berries, the leaves, and the bark of numerous buckthorns have been submitted to numerous experiments; some of those recently made have had singular results. The fruit of three of them has been long used in dyeing.

* Mons. Michel has obtained tolerable greens, not however improving by artificial light, from the berries of the *Rhamnus*

catharticus, L., and those of *R. alaternus*, L. His attempts to dye according to the Chinese methods with the barks have not been altogether unsuccessful, and have led to a discovery opening a new path to further investigations: the cloth taken out of the bath with a light nankeen dye, placed at night on the grass had assumed towards morning, and long before it was exposed to the rays of the sun, a deep green colour. This tint has the singular property of shewing itself on the upper side of the cloth, while the lower next the grass, though exposed to a free circulation of air, was scarcely coloured, has a reverse so strongly distinguished as to present in the piece the appearance of having been printed. A damp atmosphere and dew increase the intensity of the tint. Mons. Michel proceeded with his experiments. After steeping two pieces of cloth in a bath of the bark of the buck-thorn, he spread one in a cellar impervious to light, and left the other during the night on the grass; on the following morning he found the first unchanged, while the second was deeply coloured on its upper surface.

The fruit of a buck-thorn yielded a pretty lilac on silk under the hands of Mons. Persoz.

The green berries of the *Rhamnus infectorius*, L. (Avignon berries), of the *R. saxatilis*, L. (Persian berries), of *R. alaternus*, L., and *R. amygdalinus*, Desf., afford a yellow color. The fruit of the *R. frangula*, L., a very common shrub about Lyons, and there called *bourgener* or *bourdaine*, gathered before they are ripe, in July and August, yield a fast and brilliant yellow, according to Dambourney and Leuchs, green, according to Buchoz, and when they are ripe, in September and October, they dye a purplish-blue without any mordant, and green, violet, blue-violet, or blue, according to the nature of the mordant employed. Dambourney obtained on wool, from the juice of the ripe berries fermented, very fine and fast greens, varying from an apple to a dark green. The colouring matter of the berries of the *R. infectorius*

as yellow before they are yellow, and a dark purple red, as soon as they have attained maturity. Buchoz notices a similar peculiarity in the fruit of the *Rhamnus catharticus*; before ripening it yields a saffron-red; after maturity a green, known as bladder-green, and still later a scarlet. The green berries of *R. tinctorius*, have, according to Waldstein and Kitaible, dyeing properties similar to those of the fruit of *R. catharticus*, but more esteemed by the dyers.

The inner bark of *R. infectorius* dyes yellow, when fresh; brown-red, when dry; the dry bark of the *R. frangula* yields a brown or dark red, and the fresh a yellow dye. Mons. Buchner, of Munich, has obtained from the bark of the root of this buck-thorn a yellow and volatile colour, which he has named *Rhamnoxanthine*; it is found in smaller quantity in the fruit and the bark of the wood, as well as in the bark and seeds of *Rhamnus catharticus*. The alkalis dissolve it, and convert it into a magnificent purple. Dambourney secured a tolerably bright olive green on wool from the root of the *bourdaine*.

The bark of *R. catharticus* and *R. alaternus* dye yellow; the wood of the latter species dyes dark blue; and the root of the *R. infectorius* brown. Lastly, the leaves of the *R. alaternus* yield a yellow colour, and those of *R. frangula* a greenish yellow.

It will have been noticed that the wood of *R. alaternus* yields a *dark-blue*, and that the fresh bark of the same buck-thorn, and of *R. catharticus*, *frangula* and *infectorius*, contain a yellow colouring matter. A mixture of cuttings of the former and of the bark of the latter ought to produce a green. I notice this fact, to shew that the preparation of the *green dye of China*, as described by Father Helot, is possible, and I have noticed all the experiments to which the buck-thorns have been submitted, with the view of establishing the existence of a volatile principle, and to shew that the changes undergone in the colouring matter in the

different species, from red to violet, to blue, to green, and to yellow, are nearly the same. The *lo-kao* is imbued with similar principles.

It is probable that the *green dye*, so remarkable when exposed to light, is a compound of blue and yellow, having separately the same property, and united in the bark of *R. chlorophorus*. I shall notice below, when writing of the *hoang-tchi*, of the fruit of a *Gardenia* and of the *hoai-hoa*, the flower-bud of the *Styphnolobium Japonicum*, that my suspicion that the supplementary yellow of one or other of these items is obtained from them instead of a second species of buck-thorn.

VIII.

OF THE PRICE OF THE LO-CROU BARK, AND OF THE LO-KAO.

Bark of the Lo-chou.

At Azè, the *hong-pi lo-chou* costs in faggots 1000 sapeques for 100 Chinese pounds, or about $8\frac{1}{2}$ francs the 100 kilogrammes, and the *pe-pi lo-chou* 3000 sapeques per 100 lbs, corresponding nearly with $24\frac{3}{4}$ francs per 100 kilogrammes. Father Helot believes that the price of the latter is higher because it is brought from a greater distance. As it is believed that 100 lbs. of faggots yield 50 lbs. of bark, we must double the price of the former to obtain the value of the latter, viz. $17\frac{1}{2}$ francs the 100 kilogrammes for the bark of the *hong-pi lo-chou*, and $49\frac{1}{2}$ francs for that of the *pe-pi lo-chou*.

At Amoy the bark of the *lo-tsè* costs about 5000 sapeques the picul, or about 46 francs the 100 kilogrammes, and I have noticed above, that this is about the same price of this bark as that ruling at Azè.

In the province of Tchi-li the dyers buy 100 lbs. of the faggots of the wild buck-thorn for 2000 sapeques, or about 5 francs 70 cents per 100 kilogrammes, and 11 francs 40 c. per 100 kilogrammes of bark.

Lo-kao.

At Azè, 10 ounces of *lo-kao* cost Father Helot 15 dollars ; 12 dollars was the price current two days before he reached that place, and he adds that a French merchant had paid at Sou-tcheou-fou, 19 taels of silver for a Chinese pound.

The selling prices in China may be thus summarized, according to the differences in the exchange, which has risen materially between 1845 and 1857, and especially within the last four years. The exchange on London which was 4s. the dollar in Canton during March, 1849, had reached 5s. 10*d.* in August, 1853. At Shanghai, the mean of 1850, was 4s. 9*d.* ; of 1851, 5s. 1*d.* ; of 1852, 5s. ; of 1853, 6s. 3*d.* ; of 1854 and 1855, 6s. 6*d.* ; of 1856, 7s. $\frac{1}{2}$ *d.* ; and for the first ten months of 1857, 6s. 10 $\frac{1}{2}$ *d.*

The current coin at Shanghai at this time, for London bills, is either the dollar or the tael : the great rise in the exchange having temporarily equalized two currencies differing so entirely.

Date of Purchase or Advice.	Name of Purchaser or Consigner.	Place where Price was fixed.	Quality.	Price per Catty.*		Value of the Dollar in Fr. at the change of the day. †		Price per Kilogramme.
				Dls.	Cts.	Fr.	Cts.	
1845. January and July.	The Commercial Delegates in China.	Canton.		24	"	C.	5	224
17th August. 1852.	Purchase of Mons. N. Rondot.	Ditto.		28	"	"	5	255
21st August.	Consignment of Mons. d. Bourboulon.	Canton.	1st. of Sou-tcheou-fou.	35	"	"	6	362
25th December.	Purchase of Messrs. Carvalho & Co.	Ditto.	2nd. of Amoy.	48	"	"	6	508
1853. 16th January.	Letter of M. Arnaudtizon.*	Shanghai.		32	"	"	6	339
2nd May.	" of M. Carvalho.	Canton.	1st. of Sou-tcheou-fou.	20	15	S.	6	228
9th July.	Purchase of Mons. Remi.	Shanghai.	2nd. Ditto.	40	"	C.	6	430
1856. April.	Letter of Mons. Remi.	Ditto.	3rd. Amoy.	36	80	"	6	396
August.	Note of Father Helot.	Aze.	...	32	"	"	6	344
Ditto.	Purchase by do.	Sou-tcheou-fou.	...	21	60	S.	8	313
Ditto.	" of a French Merchant.	Shanghai.	...	22	"	S.	3	309
1857. 14th May.	Purchase of an English Merchant.	Shanghai.	...	19	20	"	9	286
15th June.	Ditto of a French Merchant.	Ditto.	...	24	"	"	9	357
			...	26	50	"	9	394
			...	24	"	S.	9	373
			...	25	"	"	9	389

* The Catty or Chinese pound is 604 grammes (1½ lb. avoirdupois).—TRANS.

† Exchange at Canton (C.) or at Shanghai (S.) for 1st Class Bills at 6 months' sight.

To fix the delivering price at Lyons we must add, packing freight and insurance from Shanghai to Hong-Kong, and from Hong-Kong to Marseilles, commission for purchasing at Shanghai, and on transit to Hong-Kong and Marseilles, the charges at Marseilles, customs' duty, carriage from Marseilles to Lyons and petty expenses; I am not far out in setting down all this at from 10 to 12 per cent.

The selling price has varied at Lyons, and especially recently; it has risen to 750 francs the kilogramme, and been as low as 250; the ruling price for *lò-kao* has been from 400 to 500 francs per kilogramme.

A few words on the quality of the green dye. In Canton that brought from Sou-tcheou-fou is most esteemed according to Mons. Carvalho; that obtained from Amoy is very inferior to the former: its green is less blue, but with less brilliancy, and being frequently impure, the depths of its tint varies considerably, some of the *lò-kao*, is partly soluble, some nearly insoluble in water. It has begun to be falsified to a considerable amount.

IX.

OF THE PROCESS OF DYEING CALICOS WITH THE BARK.

Mons. Arnaudtizon, Father Helot and Mr. Sinclair have severally described the process of dyeing.

According to Mons. Arnaudtizon.—The bark is steeped for 15 or 20 hours in hot water; the cloth dipped into the bath when cold without any mordant, is spread on the earth during the night, to avoid the sun's rays and for the sake of a lower temperature; frost even is necessary; the side of the cloth that is next the ground is the darkest, and forms the right side [Father Helot and Mr. Sinclair say the reverse.] The cloth is dipped several times in the bath.

Father Helot's account of the process at Azè.—The fresh bark [he says the dry bark yields no colour, while Father Aymeri

assures us that the hill men of Hi-tcheou dry the bark thoroughly] of the *hong-pi lo-chou* being first boiled, remains infused for two days; the fresh bark of the *pe-pi lo-chou* is infused for ten days. Two separate baths are used in the operation, lime water being added to each.

The calicos are dipped from seven to ten times in the *hong-pi* bath, then three times in that of the *pe-pi*; the cloth is dyed after each immersion. The cloths are spread at night-fall, but the action of the sun is indispensable. The cloth is dyed only on that side that has been exposed to the sun.

Process of Kin-tcheou-fou.—The fresh bark of the *pe-pi lo-chou* is boiled; 63 grains of Chinese potash are added for every 100 kilogrammes of liquid, and the calicos are dipped three or four times in the bath; they are sun-dried after each immersion.

Its appears that alum is used in Chantoung, instead of lime-water and potash.

The reason for the difference in the processes of Azè and Kin-tcheou-fou, is that in the latter town, as further North, it is only desired to dye the cloth, and the *pepi* answers the purpose. At Azè the dyeing of cloth is the means of manufacturing the *lo-kao*; both species of buck-thorn are necessary, and the process is more lengthy.

Mr. Sinclair.—At Amoy the bark of the *lo-tse* is put into hot water; it is then boiled for an hour: potash and alum having been added, it is poured off, filtered, and allowed to stand during the night. The calicos are dipped in this infusion, and spread on the ground in the open air, to dry, in the morning, when the rays of the sun are less powerful. The reverse of the cloth is placed next the ground. It is sometimes necessary to dip the cloth and dry it twenty times, to obtain the required shade.

The reader must notice several contradictions. It is useless to dwell on them, and as to the objections that have been raised, Mons. Persoz and Mr. Mercer say; the first in a

letter of the 4th June, 1857: "The Chinese make Father Helot say that the green dye is imparted to the calico after frequent immersions in an infusion of the fresh bark. Now all the specimens which we have received from China prove that the colour cannot have been made fast in this manner, for they have all a right and a wrong side, clearly proving that unless two pieces had been previously stitched together, the colour has been applied on one side only, either with a knife, a brush, or some other mechanical appliance. Although this objection is not alluded to in the paper of Father Helot, it is clear the Chinese were anxious to anticipate, by asserting that the cloths saturated with colouring matter after immersion in the bath, were exposed to the sun, without whose action it could neither be developed nor fixed, and that subsequently the colour, not being fast on the side not exposed to the rays of the sun, has faded in washing, and presented that reverse noticeable in all the calicos dyed green in China. It is only necessary to expose these calicos to the sun to be convinced by the change that takes place, that it cannot have been formed and fixed in the manner described."*

Mr. John Mercer had several years ago, come to the same conclusions, and addressed a letter on the 29th October, 1853, to Dr. Lyon Playfair, from which I copy the subjoined extract:—

"On examining the green China cloth which I have had for some time, and other samples of the same kind recently received, I observe several shades of green, and some of a green more blue than others. This would be hardly the case if these cloths have been dyed with a substance yielding an original green.

* Mons. Michel has noticed a well-marked obverse and reverse in cloth dyed by immersion in a bath of buck-thorn bark, and spread during the night on the ground. The obverse, that is the darker surface (violet or green,) was that exposed to the action of the little light of the night.

“All the samples of Chinese green cloth I have seen to this day, are spotted here and there with deeper tints, produced by a violet blue, varying to red, especially in the centre when exposed to light. It is probable that this green dye is the result of an admixture of this blue colouring matter and yellow, and that the spots alluded to are caused by an imperfect preparation of the blue.

“A piece of this green cloth submitted to the action to an acid, washed, then dipped in a solution of carbonate of soda, assumed a purple, sometimes a reddish, colour. This cloth, touched with the proto-chloruret of tin, becomes bright orange; washed, and dipped into a solution of carbonate of soda, it assumes a fine rose colour; exposed to the air it is re-oxydized and assumes its natural colour. These changes prove that the base of the dye, is the same substance that has caused the dark spots I have mentioned.

“The cloth dyed with the green dye of China is much darker and more blue on one side than the other: and also a deeper blue. For some time I thought it might arise from the habit of the Chinese of spreading the dyed and wet cloth on the grass, between eight and nine o’ clock in the morning, when the ground is still fresh and perhaps damp. When the dye is soluble the evaporation being entirely from the upper surface, the liquid would be drawn to that side, and carry the colour with it; the water evaporating would leave a greater amount of colour above than below. At the same time the heat of the sun acts while the cloth is drying, so as to fix the colour, and effect to a small degree what is done more energetically by evaporation. But these surmises do not explain the spots that appear all on the obverse, as if the blue, with or without yellow, had been spread on the coarsely prepared cloth, and in a state of paste, by some mechanical process. If this view be correct these cloths have not been dyed by the means described by the interpreters, but by an improved and more rapid process, or a better imitation of the means known to our dyers.”

X.

OF THE PREPARATION OF THE LO-KAO.

The cotton cloth having been dyed by repeated immersions in infusions of bark, and dried without washing in pure water, the *lo-kao*, is, according to Father Helot, extracted from the surplussage of dye-stuff in the cloth.

The dyed cloths are dipped into cold water several times, and well shaken; the water is then collected in a kettle, a layer of cotton thread is then spread on the surface of the water; fire is applied; during ebullition the colouring matter is deposited on these threads; more of the water in which cloths have been rinsed is added, till the threads are sufficiently charged with colour. They are washed in cold water, and well rubbed with the hand. The *lo-kao* is detached and precipitated. I omit minute details, they are found in the memoir of Father Helot. Finally, the precipitate being well washed till it becomes a thin paste, is spread on a thin sheet of paper lying on ashes. It is first dried in the shade, and then in the sun. The layer of *lo-kao* detaches itself from the paper, shrivels up, and breaks into small irregular, thin, light fragments with a good glance.

The account of the preparation of the *lo-kao* is very much the same.

Generally speaking, a layer of cotton thread, weighing about 3 kilogrammes and 620 grammes is required to exhaust the waters used to wash three hundred pieces of cloth. Forty pieces yield 37 grammes of *lo-kao*; 283½ grammes are therefore obtained from one layer of cotton; each gramme represents 1,060 pieces of dyed cloth.

One of the establishments at Azè dyed in 1856, according to Father Helot, 8,000 pieces, and sold about 7½ kilogrammes of *lo-kao*, and the five dyeries of Azè could not furnish more than from 18 to 24 kilogrammes. But the green dye is also prepared at Sou-tcheou-fou, in the neighbourhood of that

town, and in several boroughs of Kiang-Sou, at Ning-po, and in other towns of Tche-kiang, in Hou-nan and in Fo-kien; it must indeed be prepared in considerable quantities as a friend at Shanghai, wrote on the 20th April, 1857, of the possibility of sending 800 or 900 kilogrammes of *lo-kao* to France, which would lead to believe that one million of pieces were dyed. This is not to be wondered at; cotton cloths dyed half and half are very generally used by the people; the light green is the favorite colour of the women, and the Fokienese all wear blue and green cotton turbans.

The customs' department announces the importation into France, during the first six months of 1857, of more than 590 kilogrammes of *lo-kao*; as it is classified, for the purpose of fixing the duty among the *undefined colours*, it may be declared and entered under that general designation; this leads to the inference that more may have been imported under other designations.

XI.

OF THE DYEING OF COTTON CLOTHS WITH THE LO-KAO.

The *lo-kao*, notwithstanding its very high price, is used in China to dye common cotton cloths. The fact cannot be doubted. Messrs. Arnaudtizon, Remi, Edkins, and Father. Helot, notice it, and the two first are eye-witnesses. It is true it is for light colours only, one liang (37 grammes 79,) of *lo-kao* being sufficient for from 10 to 30 pieces of cloth, according to the depth of the shade, or from 7 to 21 centimes of *lo-kao* for a square metre. It seems that dyeing with the barks and with *lo-kao* costs nearly the same, or about 5.100 of a dollar (40. centimes) per square metre as mentioned by Father Helot.

Mons. Remi wrote to me, on the 25th February, 1853, as follows, regarding this dye-stuff:—"In the course of an excursion made by our dear consul (Mons. de. Montigny) and

myself, in the vicinity of this great manufacturing metropolis, he visited several establishments where cotton textures are dyed green with this same substance, and from that time it attracted our attention.

The following is the process adopted at Sou-tcheou-fou and at Shanghai; the *lo-kao* is not employed in dyeing either at Azè or in the neighbouring villages where it is manufactured. The *lo-kao* is dissolved hot in Chinese potash. The cloth, having been well rinsed, is dipped into the bath at a temperature of between 50 and 60 degrees; wrung on a peg, shaken out, dipped a second time, wrung again, rinsed in pure water, and dried in the open air.

For every 100 grammes of *lo-kao*, 1000 grammes of Chinese potash must be used according to Mons. Arnaudtizon; 1000 grammes according to Father Helot, 30 says Mr. Edkins.

XII.

OF THE DYEING OF SILK AND SILK FABRICS.

“I have been assured,” says Father Helot, “that silk cannot be dyed with the *lo-kao*. I do not know whether the Delegates brought back any silk fabrics dyed with the *lo-kao*, it would be easy to ascertain by consulting the experiments made at Lyons in 1847 by Messrs. Michel, Guinon, Vidalin and Renard on Chinese and Cochin-Chinese dye-stuffs. But Madame de Montigny, who was recently in Paris, had a China silk dress dyed with this substance.

A silk manufacturer, well known to those who have lived at Canton, Yi-ching senior, whose warehouse is in Tongwan-kai, was the first who sold the *lo-kao*, or that portion received by M. Guinon.

The packets bore the inscription:—“Selected with care to dye chain-silk.” The sample I obtained at Canton in 1845, was purchased of a silk dyer.

Further evidence.—I find it stated in a Canton letter of the 26th November, 1852, that “the use of the *lok-kouh* by the Chinese, is limited to fine paintings, and for dying expensive silks.” In a letter of April, 1853, it is said :—“The *lok-kouh* is used for silk ; it is possible that other substances are mixed to make it available.”—In a third letter of May, 1853, I find :—“It seems that the Chinese use the *lok-kouh* as a last bath for cotton stuffs ; but this does not apply to silk.”

Mons. Remi wrote me in 1856 :—“The green suited to the dyeing of cotton and silk, most certainly comes from the bark.” Lastly, I shall quote an extract from a Shanghai letter to a friend of mine in London :—“As for the green silk fabrics, there are some very beautiful, especially the plain, both light and darker coloured ; the merchants can distinguish at first sight, even with colours strongly resembling each other, those which are dyed with the *lo-za* and the *lo-kao*. The latter are held in greater estimation, and of a higher price, but I could not exactly understand wherein consisted the superiority of this expensive dye ; silk is dyed with the *lo-kao* at Sou-tcheou-fou and Hang-tcheou-fou.”

The Rev. Mr. Edkins observes, that if not more frequently used for dyeing silk, it is on account of the high price of the stuff ; he adds that the *lo-kao* seems better suited for rough cloths, such as cotton and grass-cloth (prepared from the *Urtica nivea*), that it has been long used by artists for paintings in water-colours, but as a dye-stuff only during the past twenty years.

Again, a dyer of Kin-tcheou-fou, assured Father Helot, that in that town the bark of the *pe-pi lo-chou* was used to dye silks, but that the process was less successful than with cotton.

It is not yet known how the Chinese dissolve the *lo-kao* and apply it to the dyeing of silk. Our dyers, however, have nothing to learn on this head from those of the Celestial Empire.

At Lyons, Mons. Guinon, in March, 1853, and Mons. Michel in April of the same year, only to mention the most successful, undertook experiments that speedily afforded them the most interesting results, but the general application of the *green dye of China* to the arts, dates from the spring of 1855. In April of that year, Mons. Guinon dyed with pure *lo-kao* spangled and cut velvets, whose green was so analogous to that obtained from the acetate of copper, that he named it *Venus-green*. These velvets were sent to the Universal Exhibition by Messrs. Gondre and Co. . The addition of yellow to the *lo-kao* was only adopted in the month of July following, when a charming shade was obtained, so pleasant when exposed to the light that it has retained the name of *Azof-green*. Messrs. Million and Co. produced in August the first dresses of this kind. Fashion had not stamped this beautiful novelty, when in October and November, 1855, rich plain stuffs dyed with the *lo-kao* were found in the warehouses of Messrs. Heckel, Teillard and Ponson.

It was about this time that Mons. Michel discovered the process that bears his name ; he presented to the Chamber of Commerce a remarkable series of samples of bright and dark shades at their sitting of the 24th January, 1856, and he read on the 6th March following, the report in which he described the means of dissolving and dyeing he had so successfully practised. This process has, since the middle of 1856, been adopted with advantage by several dyers of Lyons.

Up to that time the *lo-kao* was but little known. Mons. Guinon alone had succeeded in making use of it ; he maintained, and still maintains, his peculiar secret. The secret of the origin of the colour of those elegant dresses, that were so much admired in the autumn of 1855, was even so well preserved, that Mons. Michel only became aware of it after the publication of his own discoveries. His memoir directed general attention to this new dye-stuff, and its consumption began materially to increase. To mention only one example,

I may state Mons. Guinon who had, from April, 1855, to March, 1856, only dyed about 1,500 kilogrammes of silk with the green dye, turned out more than 3,500 kilogrammes between April, 1856, and March, 1857.

XIII.

OF THE PROPERTIES OF THE LO-KAO.

The properties of the *lo-kao* are described in the following works :—

On a Green Colouring Matter brought from China, by Mons. J. Persoz.

Note on a Green Organic Substance, used in China for the Dyeing of Cotton, by Mons. E. Mathieu Plessy (*Bull. of the Ind. Soc. of Mulhausen*, 1853, Vol. XXV, pp. 96 to 104.)

First Report of the Department of Science and Art, pp. 434 and 435).

Report of the Chamber of Commerce of Lyons on the Green Dye of China, by Mons. H. F. Michel, March, 1856, (first publication of the Chamber.)

Of the Green Chinese Dye named "Lu-koe", by Mons. J. A. Van Eijk, 1856, (*The Volks-vlijt*, 1856, Vol. XXXI. pp. 410 to 417.)

Note on a Green Dye from China, by Mr. Dan. Hanbury, October, 1857, (second publication of the Chamber, 1857, pp. 37 to 39.)

Further Particulars of the Green Dye of China, by Prof. Bleekrode, 1857, (*The Volks-vlijt*, 1857, pp. 320 to 323.)

I refer to these documents, especially to the remarkably complete memoir of Mons. Persoz, for the chemical and dyeing properties of the green dye. It will be found at the end of this volume.

I cannot sufficiently dwell on the most interesting, and, for silks, the most useful character of this dye, viz., the beauty and extraordinary intensity which the colour acquires when

exposed to artificial light. This brilliancy, attributed by some to the homogenous character of the colour, by others to the purity of the blue and yellow tints that form this green, was noticed so early as 1853, by Mons. J. Duperay, of St. Aubin, Epinay. He places the *lo-kao*, on account of this quality, above all other known greens.

(*To be continued.*)

THE INDIGENOUS PLANTS OF BENGAL.

Notes on peculiarities in their structure, functions, use in medicine, domestic life, arts and agriculture: By the REV. J. LONG.

(*Continued from page 43 of PART I, VOL. X.*)

ENDOGENS OR INWARD GROWERS.

Have one seed lobe. Harder outside than inside. Leaf veins not net-shaped.

About 50,000 species known. Parts of the flower arranged in threes.

63. **HYDROCHARACEÆ, or Frog Bit Tribe.**—Floating plants in fresh water; flowers with a spathe, or cover, when young. These plants live under the water, except just at the time of fertilisation, when the flowers rise for a few hours above the surface.

Rasanjāngi (Vallisneria alternifolia).—Grows in rivers and rapid streams where the level is not always the same. In order to enable the pistilline flowers to keep on the surface of the water, which is necessary for the fertilisation of the seed, they are made lighter than the water, and are mounted on long corkscrew-like stalks, which, by their elasticity, extend as a spiral spring when the surface of the water rises, and contract when the water sinks. When their pollen is mature, and the anthers are ready to burst, the flowers producing it detach themselves, rising by their lightness to the surface, and dis-

charge their pollen; when the seeds are ripened, the spiral flower-stalk again contracts, and carrying down the dry fruit, buries it in the mud.*

Patá shyéálá (Blyxa octandra).—Leaves sword-shaped. Used for supplying water mechanically to sugar in the process of refining it, as clay is used in the West Indies to permit the slow percolation of water. Its stamens have the same property as the last named plant, and hence its Sanskrit name *shaivál*, “the sleeper on the water.”

Páni kalá (Ottelea allsmoides).—The seeds are affixed to six sharp keels running on the inside of the joinings of the valves.

64. ALISMACEÆ, or *Water Plantain Tribe.*—Aquatics. Seeds hooked: embryo of a horse-shoe shape. Many have a fleshy rooting stem, which is eatable.

Chota hat (Sagittaria sagittifolia)—Flowers in spring. Leaves arrow-shaped. In China cultivated for its roots, which are eaten. The root is composed of many fibres, from a crown formed by the united leaves, the centre one thicker, and ending in the half putrid remains of the small round bulb which gives existence to the plant, while from its sides many suckers run a few inches, each ending in a small round bulb, which in due time produce other plants.

Bara hat (Sagittaria obtusifolia.)—The seed is bent double, with the two extremities pointing to the base, by one of which it is fastened to the bottom of the fleshy fruit. Various Brazilian plants of this *sagittaria* genus yield, from their astringency, a juice employed in making ink.

65. LEMNACEÆ, or *Duckweed Tribe.*—Floating plants. Composed of a little green scale, which looks like a leaf; from its under side hangs down a single root fibre. The leaves have acrid properties.

* Darwin has made this a poetic subject in his “Loves of the Plants.”

Tákápánú (*Pistia stratiotes*).—Two other species in Bengal, well known by the appearance of a green scum they give the water. The leaves are made by Hindus into a poultice for piles, and a decoction of them is used for their cooling properties and in cases of a difficulty in passing of urine. The leaves float on the water, absorb a great quantity of the noxious vapours as fast as they are exhaled, and change them by the aid of the sun's rays into respirable air. This change is effected by the *pistia* more than by any other plant: it is so powerful a preventative of decomposition in stagnant water, that fishes are preserved alive in water in which otherwise they would not live: this is particularly the case in Batavia. Sir C. Napier, inspecting the lines of a native regiment in the Punjab, observed coolies drawing water from a tank covered with a slimy and greenish weed, the *pistia*; he ordered it should be immediately cleaned, so it was,—but it was not until a fresh crop of weed had grown that the water became drinkable.

66. ORCHIDACEÆ.—Called Epiphytes, but by the Hindus by a simple name “sons of trees.” Of 1900 species, only two are known in Bengal, though very numerous in Assam.* Their flowers are so curious in their shape that there is scarcely a common insect, or snake, or monkey, to which some of them have not been compared.

Svet Huli (*Zeuxina sulcata*).—Found in pasture ground near Calcutta at the close of the cold season, the three upper petals of the corolla are helmet-shaped.

Budbari (*Eulophia virens*).—Flowers in the cold season; bulbs conical, flowers streaked.

* A gentleman from Assam, Capt. Lowther, has promised to furnish the Agri-Horticultural Society with a list of Assam plants on the plan of the present one. We trust he will give a full account of Assam orchids with the native names of all the plants.

67. ZINGIBERACEÆ, or *Ginger Tribe*.—The shape of their roots has given them the Sanskrit name *shringavera*, i. e., “root horn-shaped.”

Adā (*Zingiber officinale*).—The seeds are seldom met with, on account of the great increase of the roots, which are biennial. Used by the natives in cases of paralysis, rheumatism, and intermittent fever; in the Dacca district ginger yields eight to ten maunds per biggah. The natives cleanse the roots in boiling lime water, which probably injures much of the fragrant pungency: whereas in the West Indies they use simply cold water. Nearly 90,000 cwt. of ginger was imported from the East and West Indies into England in 1852.

Bach (*Zingiber zerumbet*).—Broad-leaved ginger. Leaves and shoots used as greens. Grows wild in the Concan.

Huldi (*Curcuma longa*).—Turmeric. From the dry root, powdered, and mixed with powdered wood of *Cæsalpinia sappan* is obtained the red powder used by the Hindus in the Huli games, hence probably its Sanskrit name *yoshitpriyā*, “beloved by women.” The Javanese apply its nuts pounded and made into an ointment to cure skin diseases, while the Hindus use it in bruises and leech bites, in cleansing ulcers, in diarrhoea and for worms, hence its Sanskrit name *krimigna*, “the worm-killer.” It is used for seasoning dishes, and as a dye, but the colour does not last. It yields from 60 to 300 maunds per biggah.

Ban huldi (*Curcuma aromatica*).—The flower often appears before the leaf.

Kāla huldi (*Curcuma cæsia*).—The leaves have down their middle a deep ferruginous purple cloud. The roots of another species, the rubescens, yield a starch like arrow-root. In Travancore it forms a large part of the diet of the inhabitants; it has never been tried much in Bengal.

Chandra mula (*Kampfæra gulara*).—The flowers have a purple speck on the centre of the division of the inner border. Leaves spread flat on the surface of the ground. The

roots are valued as a perfume and medicine, hence probably its Sanskrit name *chandramuliká*, "moon root."

Bhui champa (*Kæmpfera rotunda*).—The beauty of its flowers, which blow only for a day, and its having no stem, gave it its Sanskrit name, "the champa of the earth." If at the flowering time there are no leaves on the plant, the envelope of its flower is shaped like the tiles of a house.

Madan nirbishi (*Kæmpfera angustifolia*).—The natives give the root as medicine to their cattle.

Dulál champa (*Hedychium coronareum*).—Throws out a profusion of large beautiful fragrant blossoms for a long time.

Tárá (*Alpinia galanga*).—Root biennial or perennial, the stem is entirely covered with the sheath of the leaves; flower a beautiful rose colour, but no scent, though the root is aromatic. The juice of the root is used as a remedy in hæmorrhoids. Near Dacca they make twine and rope from the plant.

Keo (*Costus speciosus*).—A preserve is made by the natives from its root; though the fresh roots are almost insipid. The plant is a handsome one, with soft velvety leaves spirally arranged.

68. CANNACEÆ, or *Arrow-root Tribe*.—Starchy roots, reed-like plants, with beautiful flowers.

Mukta páti (*Maranta dichotoma*).—Mats are made from the split stem, which is hence called *shital páti*, or "the cooling reeds." A tough fibre is obtained from this.

Sarbajay (*Canna Indica*).—There are two species, the red and white: the former used by the Burmese for sacred beads, and by Hindus for necklaces. It is called Indian shot, because its seeds are shot-shaped; they are used as a substitute for coffee, and yield a purple dye. A watery secretion takes place from the points of the ribs, which terminate at the margin of the leaves. The leaves are used to thatch houses with in Cayenne. Nearly all the species contain starch in the root-stock, which renders them fit for food after being cooked. The root, boiled in rice water with pepper, is given sometimes to cattle whose

belly is swollen from having eaten some poisonous grass. It is in flower and seed most part of the year.

69. *MUSACEÆ*, or *Plantain Tribe*.—Flowers on spikes. Curved leaf veins. No proper stem, as the leaves are sheathing encircling each other, and enveloping layer within layer the flower and fruit stalk. The *rám kalá*, or wild plantain, ripens its seeds six months after blossoming, the plant then perishes down to the root.

Kalá (Musa Paridisiaca).—The fruit has no acid, hence it is good for bilious persons. The banana is like it, but its stalk is marked with purple spots, and the fruit is shorter and rounder. Its fibrous bark is made into cloth and cables. The leaves were said to be like Ostrich feathers, as they form no network, and easily split. There are twenty varieties of plantain in Tenasserim, ten in Ceylon, and thirty in Burmah.

From Asia it has been introduced into the West Indies and South America; and into England in 1680. It is more productive than wheat. In South America the fruit is dried and preserved, while the flower is separated and made into biscuits. The fruit can keep for twenty years, owing to the sugar in it. 100 parts of the recent fruit contain 27 of dry nutritive matter—the potato gives 25. In the plantain fruit out of 100 parts there are of water 14, starch $67\frac{1}{2}$, gum $4\frac{1}{2}$, cellular fibre $4\frac{3}{4}$, sugar 2, oil $\frac{1}{2}$, albumen $4\frac{1}{2}$, ash $2\frac{1}{2}$. A sucker attains maturity in a year, each produces fruit weighing from 25 to 90 lbs. In the West Indies the spiral vessels of the flower-stalk are used as tinder. One tree gives 4lb of fibre; 600lb weight of fibre might be produced annually from each acre of plantains. The plantain is used as a nurse or shade to the betel, vine, or areca. The top of the stem yields a juice good for making ink. The fibre can furnish material for paper and canvass, thus the plantain gives food for body and mind. The Chinese use the young shoots for paper-making. Called in Sanskrit *báranballabha*, “pleasing to the elephant.”

The plantain has many *spiral vessels*, *i. e.*, membraneous tubes in the conical extremities, the inside being occupied by a fibre which uncoils itself elastically; this may be spun into thread.

Jagynavalykea, the great Hindu legislator, in the 3rd book, 8th section, compares human life to the plantain tree without pith, *i. e.* empty and vain. Its long leaves 7 feet, with their parallel veins at right angles to the mid rib, led to its being compared by the ancients to ostrich's feathers, and to the Sanskrit name *ácýathchadá*. Its spike often has fruit weighing 40lbs. Its Latin name was given it on the supposition that it was the forbidden fruit Adam eat. 1607 square feet of ground yield 4000lbs of nutritive substance from plantain, which will support 50 persons, the same space planted with wheat will support only two. It is in season all the year round. The Dacca plantain is nine inches long, in Madagascar the plantains are as large as a man's forearm. In the mountains of the Phillippine Isles a single fruit or two is said to be a load for man. All the large ones require, like potatoes, to be roasted. Valuable cordage, in large quantities, is made from the plantain stem in Manilla, and extensively exported. Hemp, and the finest flax can be made from its fibres and tissues, almost as fine as those from the fibres of the *ananas*. The *fruit* dried in the sun keeps perfectly a length of time, and resembles a rich fig. Twelve months after planting, 70lbs of fruit are often obtained from a single plant. The south of Spain is the only part of Europe in which the banana is cultivated in the open air. The *veins* diverge from the mid-rib along its whole length, and lose themselves in the margin.

A curious mistake is made in *Loudon's Encyclopedia of Plants* respecting the plantain, he writes "three dozen of plantains are sufficient to serve one man for a week, instead of bread, and will support him much better."—We can only say we should be sorry to be that man.

70. **AMARYLLACEÆ.**—Bulbous-rooted. One of the few exogen orders in which poison is found. The *Agave* so useful for its fibre, for hedges, soap, sugar, wine and paper, belongs to this order.

Bara kánar (*Crinum Asiaticum*).—Under side of the leaves elegantly striped, bruised and mixed with castor-oil they are used in inflammations; in the N. W. P. they give the juice of the leaves for ear-ache. The root is used as an emetic in Java, and is considered by Dr. O' Shaughnessy, to be equal to *Ipecacuanha*.

Sukh darshan (*Crinum defixum*).—Flower fragrant at night.

Biláti anannas (*Fourcroya cantala*).—Flowers when 12 years old.

71. **DIOSCOREÆ, or Yam tribe.**—So called from *Dioscorus*, the most ancient writer in materia medica, 1800 years ago. Tuberous roots: leaves with net shaped veins; twining. The various kinds are distinguished by the shape and colour of the roots. The West Indies is their favourite country; they are there what the potato is in Ireland; raw they have an acrid principle. Though in such use among natives, none have a Sanskrit name, and are not indigenous.

Chupri álu (*Dioscorea globosa*).—The favorite yam among natives. Stems have six wings, with the angles. Membrane winged, and prickly towards the root.

Khám Alu (*Dioscorea alata*) square stems.

Rakta garániya álu (*Dioscorea purpurea*).—When the roots are more than one year old, the lower permanent parts of the stems are generally armed with prickles.

Gorániya álu (*Dioscorea rubella*).—Flowers very fragrant.

Man álu (*Dioscorea aculeata*).—Called in Bombay the Goa potato: root two lbs. weight.

Susni álu (*Dioscorea fasciculata*).—Natives extract starch from the roots. Has several stems.

Kukur álu (*Dioscorea anguina*).—Tubers columnar, perpendicular in a loose soil, but variously bent in a hard one.

Shir álu (*Dioscorea nummularia*).—Stem many fathoms long : lower part prickly.

Kántá álu (*Dioscorea pentaphylla*).—Not cultivated in Bengal, but very much so in Amboyna.

72. BROMELIACEÆ, or Pine Apple Tribe.

Anannas (*Anannás sativus*).—An American plant ; its name is of Brazilian origin, the name *pomme de pin*, “pine-apple,” was given it by the Spaniards from the supposed resemblance of its fruit in shape to some pine cones. It was unknown to the Arabs, Greeks, or Romans. Cloth as fine as muslin is made from the fibres of the leaves.

A pleasant wine is made in Jamaica from its fruit. The best in the world are the Bengal : It was introduced into Bengal in the reign of Akbar by the Portuguese, who brought it from Malacca. In Mexico they are commonly suspended to the balconies for the sake of filling the house with their delightful fragrance, as they can subsist for a long time on the fluids they contain, or on the moisture they absorb from the atmosphere. The fruit consists of numerous concrete ovaria, with the adherent perianths become succulent. The unripe juice has caustic properties, and can corrode a knife.

It is propagated by suckers, from the tuft of leaves at the top, a continuation of the axis. In Tenasserim a boat-load is sometimes sold for one rupee.

Discovered in America in 1513, in 1594 it was cultivated in China, the fruit was first brought from Santa Cruz to the West Indies then to China ; and at a subsequent period to Bengal in the East Indies. Introduced into England in 1690 from Leyden ; the English fruit equals the tropical, and is called the “queen of fruits.” 50 varieties cultivated in England in stove hot-houses. In Italy it does not thrive, as the leaves are so porous, and the climate so dry, that it shrinks up. The Society Islanders call it the white man’s *pandanus*, because its foliage, and matured fruit, are like those of the *pandanus*.

It is called by natives *kutl suffree*, or “the jack for a journey,” as its fruit ripens even when carried about.

73. SMILACEÆ, or *Sarsaparilla* Tribe.—Climbers.

Kumáriká (*Smilax ovilifolia*).—Armed with strong prickles. Considered to have all the properties of sarsaparilla. Root mixed with cucumber, ginger and oil is used in headaches.

74. PONTEDERIACEÆ.—Aquatics: blue flowers.

Nauká (*Pontedera vaginalis*).—Its Sanscrit name, *nilutpal*, “the blue lotus,” denotes the qualities of all of this order. Three other species in Bengal. The root masticated is considered a remedy in tooth-ache: its bark pulverised along with sugar is eaten for asthma. *Pontederia hastata* common.

75. LILIACEÆ.—Bulbous roots. Beautiful flowers, used among natives as the symbols of purity and modesty.

Rajani gundha (*Polianthes tuberosa*).—The Malays call it “the mistress of the night,” as at night it scents the strongest; a great favourite in Cochin-China; it has been observed after thunder to emit sparks of a bright flame from those flowers that were fading.

Murba (*Sanseveria Roxburghiana*).—Bowstring hemp. Its fibres silky, but strong, called China grass, very valuable for rope or paper. The ancient Hindus used a thread extracted from its leaves to make the *paita* of the Khetry class.

Grita kumári (*Aloe Indica*).—This may thrive in poor soils, as, in common with the aloe tribe, it draws its chief nourishment from the air; the fibres are valuable. An ink is prepared by Muhammedans from the juice of the pulp; this juice also used for sore eyes.

Rasun (*Allium sativum*).—Garlic. The expressed oil is used by the native doctors in rheumatism, in asthma, cough, and for promoting digestion, particularly among vegetarians. The author of “*Talif Sherif*” has employed its sherbet with much effect in cases of paralysis.

Gandan (*Allium ascaloneum*).—Schallot. Stem flat-leaved. Stamens three-pointed.

Peyáj (*Allium cepa*).—Onion. Came originally from Egypt. Used by natives for hæmorrhoids, and baldness. Its Sanskrit name *latárka*, “sun-creeper,” denotes the value set on it.

Hilluá (*Asparagus officinalis*).—Asparagus. Leaves bristly.

Shalamuli (*Asparagus racemosus*).—Root very fragrant; has many tubers; boiled in milk it is given in bilious disorders, but the bark must be removed, as it is poisonous. The leaves boiled and mixed with ghee are applied as a poultice to boils.

76. COMMELYNACEÆ.—Spider worts. The fleshy roots of some contain starch, which when, cooked, are fit for food. The Chinese use some of them for coughs, asthma, &c.

Páni kánkra (*Commelina salicifolia*).—Flowers deep azure.

Kánkra (*Commelina Bengalensis*).—Flowers blue.

Jatá kánkra (*Commelina communis*).—Flowers a bright blue.

Kándali (*Aneilema nudiflorum*).—Flowers small and blue.

77. PALMACEÆ, or *Palm Tribe*.—Called by Linnæus in modern times, and by Amer Sing in Hindu times, “kings of the grasses.” They vary much, some are 5 feet long, some 500; out of 1000 species ascertained, very few are known in India. South America seems to be their favorite locality. They are of all orders, the most useful for economical purposes, food, building, clothes, lights, &c.

Supari or *Guyá* (*Areca catechu*).—Betel. There are 20 different species, one of these, the *Rámguya*, is found at Chittagong. It is a social plant, growing in groups marked by their beautiful appearance, hence likened by an Indian poet to an arrow shot from heaven. This palm often grows 50 feet high, with a diameter of 2 feet, has no branches; its leaves are very beautiful, forming a round tuft at the top of the trunk, which is usually about 6 or 8 inches in diameter, straight, round, and marked with parallel rings. The leaves which are feathery, spring forth in pairs, that alternately

cover each other, encircling the top of the trunk, and thus producing an oblong head larger than the trunk itself; they are not more in number than six or seven, feet long, on a stalk 4 feet in length. These leaves break and fall off in succession, and from their axils issue the sheath which enclose the flowers and fruits. The fruit is called a *drupe*, about the size of a pullet's egg, and does not fall from the tree even when ripe, it has a yellowish shell, thin, with arched veins cohering with the pulp all round. In Johanna, the nut is used for dying cotton red, or making ink. On the Coromandel Coast 300 nuts on an average grow on one tree. A cargo of betel nuts generates so much heat that the crew cannot sleep between decks. A good tooth-powder is made from the nuts. In the Cossyah country the natives measure distances by the number of mouths of betel-nut chewed on the road.

Bet (Calamus Rotang).—Ratan. More than 4,000,000 are shipped annually from India. Delights in a rich moist soil, where there are bushes and trees for it to climb on: Fl. R.S. Fr. C.S. Climbing to a vast extent, enveloped in the thorny sheaths of the leaves. *Leaves* feathery, eighteen to thirty-six inches long. *Leaflets* armed on their margins with minute bristles pointing forward, and a few erect distinct long bristles on the upper surface. *Sheaths* armed with numerous compressed thorns: *Leafstalks* channelled, having straight and recurved thorns on the under side. *Flagelli* one from the sheath of each leaf near its mouth, like the lash of a whip; A bridge eighty feet in length has been constructed in the Himalayas entirely of ratan. The shape and flinty secretion of this gives it an affinity in some points more with the bambu grasses than with the palms.

Tál (Borassus flabelliformis).—Palm tree. In the Madras Presidency a caste called *shanars* draw the toddy or juice from it. The tree lives to a great age: the wood is harder at the bottom than at any other part of the stem. The

diameter of the stem differs very little in size when the tree is young; in consequence of this, and of its cylindrical form, the palm is never strangled by creepers, as many exogens are, the bambu however when old, increases in diameter from half an inch to two feet; some *palm* trees bulge out in the middle, and then contract again.

The number of external rings which indicate the fall of leaves from the trunk of palm trees, is supposed by some to coincide with the number of years the tree has lived. The leaves are palmate, plaited, and cowled: stalks serrate, near six feet long, flat, a little hollow and rough, with spines along the edges. The fruit varies in size from a small orange to that of a child's head. In Celebes it is called *tal*. Its Sanskrit names are *kasapatrabân*, "with saw-leaves,"—*tantaniryas*, "thready exudation,"—*trinadrum* "the grass-tree.

The veins are straight, arising from towards the base of the mid-rib, with which they lie nearly parallel. 100 can be planted in one beegah, and they fertilise the ground, for the grooves of the leafstalks, and the leaves, are well adapted for conveying rain water. The top of this tree is often seen issuing from the stem of a banyan, owing to the birds dropping seeds on the palm tree, which germinate. A native work gives 801 uses of this palm; the natives apply the sap of the root and trunk to cure sores, and in cases of dysentery. A flour is made in Ceylon from the seeds.

Tará (Corypha taliera).—The leaves are palmate, pinnatifid, sub-rotund, plaited; the inflorescence is shaped like a pyramid: it flowers in March, and the seeds ripen ten months afterwards. Trunk about 30 feet high. Leaves used to write on with pointed steel bodkins, and for the rafters of houses. Leafstalks from 5 to 10 feet long.

Bajur (Corypha elata).—Flowers in March, but seeds require twelve months to ripen.

Khajur (Phœnix sylvestris).—Wild date. Its Sanskrit name is *madhukeshir* or "honey-milk"

The *Phœnix dactylifera*, the chief food of the Egyptians, gave its name to Phœnecia. There are 46 varieties of it in Sahara, and almost all the population of Fezzan live on the palm dates for 9 months of the year. It bears from its 10th to its 35th year. Each tree yields about 180 pints of juice: Every twelve pints give by boiling 1lb of goor, yield 7lbs of sugar. A single spathe contains about 12,000 male flowers; but this tree does not thrive in Bengal, owing to the heavy rains.

Hintál (Phœnix paludosa).—The trunks of the smaller ones are used by the natives as walking sticks; they think when provided with such a staff that snakes will get out of their way.

Nárikel (Cocos-nucifera).—Cocoa-nut. The liquor toddy, is obtained by wounding the spathe of this tree, which is two feet long; a cup-full in the morning is good for constipation, and purifies the blood; in the day time the heat ferments it; an inferior sugar is also made from it. The liquor in the growing cocoa-nut is a refreshing drink. By scraping down the ripe kernel of the cocoa-nut, and adding a little water to it, a white fluid is obtained by pressure, which may be used as a substitute for milk. The oil is used for the hair, for burning, and, in England, for soap and candles. At the top the germ of the new growth yields a substance which is a substitute for cabbage. Vinegar is procured from toddy. On the outside of the lower part of the branches, where they spring from the stem, and are partially covered with the coarse vegetable matting of the tree, is a soft, downy, light brown coloured cotton. It is used for stanching blood. The Hindus say Visamitra created it in his progress to make a human being, in rivalry of Brahma, the nut being the first rudiment of the head, and that the eyes can be seen. It is not a native of America. On Ceylon, along the coast between Colombo and Matura, for 100 miles, there is nothing but one cocoa-nut garden. On the shores of the Gulf of Curicao

there are groves of 9,000 plants. One of the nineteen Hindu castes, the Shanar, is exclusively devoted to the cultivation of the cocoa-nut: which is deified by Hindus. The winged leaves extend in a graceful curve. Leaves eighteen feet long, twelve in number, radiate as spokes. The mid-rib is ten inches in circumference: the flowers, enclosed in a sheath. The *roots* are not wide-spreading, hence it is planted near Hindu houses, and its shade nourishes a good grass. A bird builds its nest at the extremity of its leaves. It has patrician rank among the palms, rising with one foot diameter to eighty feet, marked with circular rings, and a fibrous bark near the root. The male and female *flowers* grow on the same stalk. In the lower part of the shell is a hole through which the germ issues. The closed bud, flowers, tender drupe, immature nut, in all the different stages of progress, at the same time appear on one tree. The Coromandel cocoa-nut is a reddish yellow colour, hence called the Brahminical nut. The Canarese husk is green. The Malabar has its fruit turbinated. The sea air is necessary for it, even sea water does not rot the roots. Lives to 80 years, gives fruit from 40 to 50; after 60 declines. Should it lose its head, its roots cease to acquire nourishment. The seed is sown in the husk; after 18 days the germ comes up: one month after sowing the root is strong enough to burst the shell; the roots are very deep, hence little affected by storms. Salt is put at the bottom of the holes. In Ceylon the trees bend towards the sea. The fibrous net-work stem is so elastic as to cause a cannon-ball to rebound from it. The sugar or jaggry from it makes a very strong cement; 3 million pounds of coir were formerly made by the Dutch in Ceylon. In South America each tree yield a 100 nuts. The cocoa-nut flower looks, when closed, like a pod, but when cut open, the most beautiful wax-like flowers burst out of it. The cocoa-nut is so common in this country, that many pass it by without noticing the peculiarities of its

structure, and its adaptation to the country. We give an extract on this subject from *Archer's Economic Botany*, p. 69. *

78. PANDANEACEÆ.—Screw Pines. This order seems a compound of grasses and palms. The spongiolets of the aerial roots are composed of numerous very thin exfoliations, forming a sort of cup to hold water for the supply of the roots. The stem next the ground is very slender; higher up it is thicker, and sends out aerial roots, which seek the soil and act as stays upon the centre. The leaves are arranged like a corkscrew, numerous crystals of lime are found in the seed-shell.

Keyá (Pandanus odoratissimus).—In the Mauritius matting and packing bags are made from its leaves. In Cochin-China hedges are made with it, and its leaves are used for feeding tame elephants. Its flower is a great favorite with the Burmese. The stem is dichotomous, or having the divisions in pairs. The terminal leaf-buds constantly develope.

* The peculiar triangular form of the cocoa-nut has been pointed out as a special provision for its dissemination; thus, growing as it does frequently near the shores of the sea and rivers, its large seeds drop in the water and their shape particularly adapts them for sailing: one edge being downwards forms the keel while the upper surface, being flat, is acted upon by the wind, and propelled by it along the surface, until it reaches some coral reef, or shore where, being stranded, it vegetates and rises to be a magnificent palm, affording shelter and food in abundance. The coir and husk too, assist in this economy of nature: as the exposure to moisture, and the heat of the sun, are conducive to vegetation, and as the salt water would destroy the young plant if its tender shoot and home should be pushed out into the sea, a curious arrangement takes place, as soon as the shoot and root push out from the foramen, they take a direction towards the other end of the nut through the mass of coir fibre; this gives an increased weight to that side of the nut, which acts as ballast, keeping it downwards and under water. The coolness to which the shoot is thus exposed assists in keeping the vegetative power in check; but no sooner has it landed upon some congenial soil, than it throws out its strong roots, and soon renders a barren island fertile and verdant.—*Archer's Economy of Botany*.

The *Pandanus odoratissimus*, is famous among Sanskrit poets for its fragrance and is found every where in Arabia and China. The terminal bud is eaten as cabbage. Umbrellas are made of the leaves in South India: and in the South Seas, mats, cordage and hutting.

From the *Pandanus odoratissimus* is prepared a distilled water, gently stimulant, and promoting perspiration. Snakes are very fond of lurking in this plant.

Keya Kántá (Pandanus fœtidus).—The smell of the flower is very offensive. Such an abundance of crystals of lime are in the seed-coats of this family as to be seen with the naked eye. In Burmah a species grows near tide-waters, very useful for making mats.

79. TYPHACEÆ.—Bulrushes. Ditch growers, bear a close resemblance both to sedges and screw-pines.

Rám Hoglá (Typha angustifolia).—Leaves used for mats.

Hogla (Typha elephantina).—Elephant grass. A diminutive species of screw-pine. Used on the banks of the Indus to bind the soil together, and also as buoys to swim with. Fl. R. S. Grows in stagnant water. *Roots* stoloniferous, abound in starch, employed in the East of Asia in dysentery and measles. *Culms* glossy, pointed at the insertion of the leaves. *Leaves* sword-form, below, near the sheath, a little convex on the outside, concave within; used for thatch; no *corolla*. *Seed* oblong, carried about by the wind like the seed of the thistle, by means of the permanent downy fusiform calyx. Elephants fond of it. Anthers wedge-shaped. *Pollen* mixed with water forms a kind of bread in Scinde, Western Australia, and New Zealand, as also in Bengal; it is inflammable like that of *Lycopodium*.

80. AROIDEÆ.—Have no floral envelopes. In cold climates many are herbs which become trees in the tropics; many of them, when raw, have an acrid juice: Some of them in germinating give out a sensible quantity of heat, while

the emanations produce dizziness, head-ache and vomiting. The structure of their flowers is worth observing.

Mán kachu (*Colocasia Indica*).—A favorite in Indian curries. The root is used for swellings of the abdomen; reference made to its properties in the Vaidea work "*Drabea Gun.*" A variety of it, the *mán giri*, has the leaf-stalks of a darker colour; in Kartik month the natives in East Bengal worship Kalmi, Sashini, and this plant.

Gaj pippul (*Scindapsus officinalis*).—A parasite, the fruit is used in medic

There are others, such as the *kántá kachu*, *kántá mán*, but they belong to hilly districts, the former is a remedy in native diseases.

Shvet bach (*Acorus calamus*).—Sweet flag. A substitute for bark, the leaves are fragrant, and the root tonic and anti-febrile; given to children in cases of dyspepsia attended with dysentery. Linnæus observes that it is the only native aromatic plant of Northern climates.

81. CYPERACEÆ.—Sedge tribe. Might be called the "grass of the water." Distinguished from grasses by having solid, angular and unjointed stems. Their not having joints was known to the Romans, who hence invented the proverb "*nodum in scirpo queris.*" The order, though not handsome, has its name *Cyperaceæ* from the Cyprian Venus. 212 species are known in New Holland. A paper was made from one of this order—the papyrus—why may not others answer the same purpose? Sedges have not, as grasses, nutritive qualities.

Jál muti (*Cyperus pygmæus*).—Seeds three-sided.

Pāti (*Cyperus inundatus*).—Stalk exactly a triangular shape. It serves very much, like the bent grass in Holland, to bind the banks of rivers, which are overflowed by the tides: mats are made from it.

Chunchá (*Cyperus compressus*).—Many of the leaves are longer than the stalk.

Gol methi (*Cyperus seminudus*).—No leaves, eaten only by buffaloes.

Mutha (*Cyperus hexastachyus*).—Hogs very fond of the roots, hence the natives use them when dried and powdered as a perfume at their weddings and as a tonic and stimulant in cholera. The Sanskrit name for a hog is *mastad*, i. e., “the matha eater.”

Nāga muthā (*Cyperus pertenuis*).—Roots used by Indian women for perfuming and cleaning their hair, hence its name the *Nagar mutha*, i. e., “city or polite grass.”

Gol malanga (*Cyperus Roxburghii*)—Stalk sometimes twenty feet long.

Mādur kāti (*Cyperus pongorei*).—So well known for the mats made from its stalks; another of this genus, the *chāmāti pāti*, is useful for binding banks together.

Shvet Gothabi (*Kyllingia monocephala*).—Its fragrant root is reckoned an antidote to poisons. The exclusion of light turns plants white, but in this plant, when the heads are shaded, they are generally more green.

There are others, as these—the *chota gothuli*, *barithi*, *bara chuncha*, *behuyá*, *pāni molangá*, but there is nothing particular to note of them.

Keshár (*Cyperus kysoor*).—Indian bulrush. The roots are eaten in fever, and given as offerings to the deities.

Chencka (*Limnochloa plantigenea*).—Seeds beset with bristles.

82. GRAMINACEÆ.—Grass tribe. The name “Grass” is common to the Sanskrit (*ghas*) Anglo-Saxon, and Icelandic languages. Out of more than 2000 species known, scarcely more than one is really unwholesome. Cattle feed on the leaves, men and birds on the seeds. The cultivation of the various species of grasses is much neglected in India, though they are so useful in binding the soil.

There are many as the *shvet gothubi*, *keshori malangá*, *talnara*, *karatiyá*, *bara karátiyá*, *chunchu murmurá*, *pat*

patichenchaká, *bara keshoryá*, of which there is nothing particular to note.

Mayná or *Kodu* (*Paspalum stoloniferum*).—Seed used instead of rice. Cattle very fond of it.

There are others, as the *kangu junyá*, *chitrichirye*, *patinur*, *chota galgánte*, *chin ghás*, *baranda barethi*, *naradal*, *jupikangká*, *nákagáli j'lgánt*, *pongínachi bajrá*, *shonti ghás*, of whom nothing particular is to be noted.

Shiriyá ghás (*Helopus annulatus*).—Flower cups very hairy.

Kangu (*Panicum Italicum*).—Called in Sanskrit *priyangu*, as its seeds are eaten by natives. It yields fifty-fold, and two crops in the year.

Dal (*Panicum stagninum*).—The stalks towards the base rest on the ground, and strike root, above erect for two feet. Flowers three-fold below above in pairs; fond of swampy ground.

Sámá (*Optismenus colonus*).—Seeds an article of diet. Yields fifty-fold; the *bara shámá* of this genus is made no use of; there is also the *dámrá shama*. At the Durga Puja festival the Hindus use the *shama* along with the plantain leaves and *bel* fruit to make the figure of a wife for Gonesh.

Juyár (*Sorghum vulgare*).—Indian millet. Its long awns protect the grains from the rapacity of birds; it yields a hundred-fold. Though the straw is thick and solid, yet all kinds of cattle are very fond of it. The *kála* and *sádhá debdhan* of this genus are also used for food.

Chorá kántá (*Chrysopogon acicularis*).—Persons walking in the jungles will remember this from its troublesome seeds sticking so much in the stockings, and causing itching.

Ulu (*Imperata cylindrica*).—After the first rain in May, the fields are white with this, which presents a beautiful sight; the whiteness is caused by the quantity of cereal that surrounds the insertion of the flowers. The Telingas use it in marriage ceremonies, the Bengalis for thatch.

Kásh (*Saccharum spontaneum*).—The great quantity of a silver-coloured wool which surrounds the base of the flowers, entitle this to its Sanskrit name *kásh*, or “the shining” a name for Benares also. Useful for mats, thatching, and as food for buffaloes.

Páti khári (*Saccharum fuscum*).—Native pens made from the stalks : also used for light fences and screens.

Uk (*Saccharum officinalum*).—Sugar-cane. Venetians imported it from India prior to 1148 : introduced by the Saracens into Sicily, Rhodes, Crete : its Sanskrit name *shakar*, the origin of its Latin and English names. It has been indigenous in Bengal from the earliest period, being a favorite present to the Gods, and used by native doctors for diseases of the chest and worms : given also as an antidote to arsenic. The process of claying sugar was discovered by accident, a hen with muddy feet having walked over a cooler full of sugar, it was noticed that where the clay from her feet had remained, the sugar beneath it was altogether cleared. The three principal kinds of sugar-canes in Bengal, are the *kajure*, or purple-coloured, growing in a dry soil, the *puri*, or light-coloured, and the *kullor*, or white, growing in swampy lands.

Teng (*Saccharum procerum*).—Stalks used for screens.

Shar (*Saccharum sara*).—Arrow-cane. Its long stalk of twenty feet, with the beautifully soft silky hairs of the flower waving in the wind, gave it the Sanskrit name *gundra*, “the playful,” and *shara*, “the arrowy.” It is often mentioned in the Puranas, the Indian god of battle, Kartikeya, having been born in a grove of it, which burst into a flame. The gods gave notice of his birth to the nymph of the Pleiads, who descended and suckled the child. Menu directed that the holy threads of the *paita* should be made from the culms of this, as being holier even than *kusá* grass. From the leaves tow ropes are made by the Allahabad boatmen.

Khaskhas ghás (*Andropogon muricatus*).—It is a fragrant grass. The Botanic name means bearded, *i. e.*, having a tuft

of hairs on the flower. An infusion of the root is taken in India to produce perspiration in fever; an ointment prepared from the root is also used to destroy lice. Used in the Decān for thatching' bungalows. *Bena* is the name of the plant, and *khuskhus* of the root. The poets have given nine names to it thus arranged in a Sanskrit sloke:—

Abhaya, nalada, sevyā, amrinala, jalāsaya,

Lamajjaea, laghulaya, avadāha, ishtakápatha.

Sandha vena (*Andropogon schænanthus*).—Lemon grass; known by its smell, which resembles a mixture of roses and new mown hay. Useful in colds and head-aches to produce perspiration. The infusion of the leaves is esteemed by Indian doctors to be an excellent stomachic, and a substitute for tea; the natives of the Moluccas extract from them a pleasant essential oil. The young propagating shoots issue from the axils of the leaves. Leaves near the root bifarious: the fresh ones much used as a substitute for tea. Tonic, slightly stimulant; centre of the culm used to flavour curry. Sanskrit name *málátrinak*, "grass-garland"—*bhustrinang*, "an earth-grass." Cultivated in Arabia, Ceylon, and the Moluccas. The Native governments so valued pasture grasses, that some of the pasture of the sandstone hills, south of the Kistna river, where the lemon grass is found, was reserved for their own cavalry.

Páni shirá (*Hæmarthea compressa*).—Stalks very long and very thin.

Bákshá (*Rottbolla glabra*).—Grows in moist places near paddy land; leaves sword-shaped.

Makká (*Zea Mays*).—Maize. It is the rice of Mexico and the United States. Indigenous to America, hence its name Indian corn. The pride and boast of American husbandry. Extensively cultivated in Egypt, Java, and Africa. It has a jointed stalk with alternate leaves like flags. The stalk are surmounted with a loose bunch, or spike of male flowers, of various colors, having oblong oval chaffy

empalement, opening with two valves, each enclosing two flowers. Seeds sometimes blue, green, red, or yellow. From each seed issues a filament, which when cut, the tree will remain barren. There are thirty different kinds, Sometimes fourteen feet high. Often *yields* four hundred per cent. The *Indians* of N. America used to sow it at the time a certain tree budded. A sugary juice is obtained from the *stalk*. The cause of the indigenous civilization of many of the Indian tribes. The spathe, or delicate elastic leaves, enveloping the grain in its head, is used for bedding. Named along the Dardanelles “reed wheat.”

Kanch gargar (*Coix lacryma*).—Called “Job’s tears.”

Bená Yoni (*Sporobolus diander*).—Flowers in the rainy season.

Páni durbá (*Sporobolus tenacissimus*).—Abundant in the West Indies.

Dhán (*Oryza sativa*).—Rice. The chief food of one third of the human race, hence well entitled to its Sanskrit name *vrihi*, “the spreader.” Forty or fifty different kinds of rice are known in India, and more than a hundred in Ceylon. Menu writes of rice wine, called *pishti*, *i. e.* arrack. Though a bag full of it was introduced into America only two centuries ago, yet it produced in 1850 more than 215,000,000 lbs. The *Santals* use immense quantities of a spirit prepared from rice in their feasts and religious ceremonies. The Chinese apply lime water to rice with great success; we know not whether that has been tried in Bengal. In North America the sowing rice in damp fields is very prejudicial to the health of the negroes, so also in Lombardy; it is not so in Bengal.

Durbhá (*Cynodon dactylon*).—Three-fourths of the food of horses and cows in India is made from this grass. Some of the leaves tapering very sharply, have given rise to the Hindu saying of an acute man, his “mind sharp as the point of a *kusa* leaf.” A cooling decoction is made from its roots by native doctors. Sir W. Jones says of its flowers “they are

among the loveliest objects in the vegetable world, and appear through a lens like minute rubies and emeralds in constant motion from the least breath of air." The ancient Hindus believed it was so beautiful that a nymph had taken up her residence in it.

Nal or Darma (Amphidonax karka).—Indian reed. The Greeks used to say that reeds had contributed to subjugate a people by furnishing arrows, to soften them by framing musical instruments, to educate them by forming pens.

Yaba (Hordeum hexastichon).—Barley. Native place unknown.

Gom (Triticum vulgare).—Wheat. Flowers in the cold season.

Kush (Poa cynosuroides).—Used in Brahmin ceremonies.

Báns (Bambusa arundinacea).—The cells and partitions are so large that they are used as cases to contain papers. The stem of all the grass tribe is originally solid, but owing to its diameter increasing more rapidly than new tissue can be formed, it becomes hollow. A flinty substance called *tabasheer*, or in Sanskrit *tvakkshirá*, is found in some female bambus; it is indestructible by fire, and is used as a tonic in medicine.

Tulda bans (Bambusa tulda).—Common bamboo. Thick shoots used for pickle; a thicker sort is the *piga bansh*, used for scaffolding, as the *bánsini bansh* is for basket-making, and the *behuri bansh* for a Brahmin to hold when invested with the páita, there is also the *bálku báns*.

CRYPTOGAMIÆ.

Whose fructification is hidden, unknown, or irregular.

83. CHARACEÆ.—Aquatics; always submerged; give out a foetid odour. With a microscope the motion of fluids in them can be seen.

Called in English stone-worts from the lime in them. Their stems being encrusted with carbonate of lime may be of use as a manure; the abundance of this weed is one of the sources of the malaria of the Campagna of Rome. The fens in Cambridgeshire are adding year by year earthy matter in abundance from the deposit of *Characeæ*, which thus elevate the low, swampy soil.

Kantá Jjáŋghi (*Chara verticellata*).—Joints of the stems somewhat prickly.

Pátá Jjáŋghi (*Chara involucrata*).—Used to purify water and sugar: it attracts the filthy particles out of the objects with which it is connected.

Rasna Jjáŋghi (*Chara furcata*).—Said to cause rice to rot that grows near.

84. *EQUISETACEÆ*, or *Shave Grasses*.—A name they have from their flinty stems cutting the mouths of cattle; hence they are useful for polishing furniture.

85. *POLYPODIACEÆ*.—Ferns called *Dolypodia*, from having many roots. The ashes of some ferns form a potash used in making glass; the roots of others are sudorific. In Norway, Scotland, and Himalayas, ferns are cooked and eaten. Heat and shade are necessary for their growth.

In the Madras Presidency is a fern (*Adiantum melanocaula*) called *mayur shikhanda*, from the resemblance it bears to a peacock's tail: the *káli jjhamp* in Bengal is of the same species. In Jamaica, the same class are used for sore throats and consumption. The *veins* are all of equal size.

Chitua borá (*Polypodium glabrum*).

Garur (*Polypodium quercifolium*).—Abundant in New-Holland.

Dápu (*Polypodium proliferum*).—Root used in fever.

Chákulyeá (*Hemeonitis cordifolia*).—Used as a medicine in connection with native *pánchan*, or compounds.

Pánkánkrul (*Aspidium unitum*).—The *indusium*, or covering, is shaped like a buckler, hence its name. Forty genera known.

Káli Jhám̐p (*Adiantum leonatalutum*).—Called *adiantum*, or dry, from the nature of its stems, which, though you plunge in water, you cannot wet.

86. MARSILEACEÆ.—Creeping plants, living in ditches.

Susni shák (*Marsilea quadrifolia*).—Leaves eaten produce sleep, according to native accounts.

87. LYCOPODIACEÆ, or *Club Mosses*.—Derive their Botanic name from a fancied resemblance to a wolf's foot. Moss-like plants, with creeping stems and leaves, tile-shaped; they are a link between ferns and mosses. The *thecæ* contain a powder very inflammable, used in fireworks and in theatres to produce artificial lightning.

Sitáhár (*Lycopodium phlegmarium*). In the Sunderbunds chiefly.

Hátájora (*Lycopodium imbricatum*). Flowers in the rains.

88. MUSCI, or *Mosses*.—They have been called the corals of the tree. Dr. Wallich collected in India 148 different kinds of mosses, but very few are to be found in the alluvial soil of Bengal, and with no distinct native name.

89. HEPATEACEÆ or *Liverworts*.—Few in Bengal.

90. LICHENACEÆ.—Valuable for dyes: 2400 species known.

91. FUNGI, or *Mushrooms*.—The Ostiacks, a Siberian tribe, make a preparation from a mushroom (*Agaricus muscarius*) which will kill the strongest man in twelve hours. The Russians during their fasts live entirely on mushrooms, and are often thrown into violent convulsions in consequence.

Mushrooms develop their cells with wonderful quickness, one has been known with cells $\frac{1}{400}$ of an inch in diameter to have developed at the rate of 66 million cells in a minute, and continuing that for 12 hours: cells in aquatic plants are ordinarily $\frac{1}{50}$ of an inch in diameter. The old cell of *fungi* is transformed into a new plant by new cells originating in it and gradually taking its place.

The old Pandits so detested *fungi*, that they put in the mouth of Yam, the Regent of Death, the following words.

“Those who eat mushrooms, whether springing from the ground or growing from a tree, fully equal in guilt the killers of Brahmins.”

Twenty different species are known, but without distinct native names, all are called *bángcháttá*, i. e., “the frog’s umbrella,” corresponding to the English name *toad-stools*, and the Urdu *samp-ki-topi*, or “snake’s hat.” One species is edible, and may be distinguished by its being of middle size, the gills of a flesh colour, changing as they advance to a chocolate, and of an agreeable smell.

Korak (Agaricus edulis).—Eaten by natives when boiled in oil: the widows of Brahmins and Khayists, will not eat this fungus, from a notion that it springs from stolen meat buried in the earth.

92. SALVINIACEÆ.—Floating plants, with reddish stems. Order named after a Professor of Botany at Florence.

Páná (Salvinia imbricata).—Flowers in the rains.

Indukáná páná (Salvinia cucullata).—Leaves shaped like rat’s ears.

Táká Páná, Ulki Páná (Salvinia verticellata).—Its name *ulki*, means “a Hindu sectarial mark on a woman’s forehead,” which it resembles.

Correspondence and Selections.

PARTICULARS REGARDING CERTAIN SPECIMENS FORWARDED DURING 1858-59 FOR THE GARDEN AND MUSEUM OF THE SOCIETY: WITH NOTICES RESPECTING THE FLORA AND VEGETABLE PRODUCTIONS OF UPPER ASSAM.

(Communicated by Capt. W. H. LOWTHER, 2nd in Command Assam Local Battalion.)

If you will believe me, I will tell you that I have been working in behalf of our industrious Society as zealously as a honey-bee for the hive. Since the commencement of October I have been scouring the entire Suddyah frontier in pursuit of marauding Mishmees, and at the same time "opening up" (*America*) the vegetable treasures of the "great eastern wilderness" (as I always style my locality). If there be one remarkable feature in the botany of our valley, it is that of monotony; for whole days together you will often see many thousand specimens of *Mussaenda*, *Thunbergias*, *grandiflora* and *coccinea*, *Asclepias curassavica*, and many equally common plants without novelty: but it so happens that, occasionally, some rich or rare denizen of the mountains is transported by landslips, or torrents, to the shores of our great rivers, where the stranger deposits itself, and exists. Under these circumstances, far up the Dehong, I was so lucky as to discover a floral treasure, which will certainly prove an acquisition to the parterre (if new, as it is to me), recommended by hardiness, height, beauty, and fragrance. I will not take upon myself to classify this beautiful shrub, which is gaudy as an *Ixora*, and sweet as a rose: dried specimens are seasoned for an opportunity of transmission. *Description*—habit, trailing; stems, 3 or 4 in. circumference, leafless for 7 or 8 feet, then suddenly expanding into delicate branches; leaves rich green, glabrous and abundant; the bloom in a mass consisting of terminal corymbs, delicate rose color, and as sweet as *Echitès caryophyllata*; altogether, it has the habit of an *Apocynum*. There was but the one vigorous specimen, and this I divided piecemeal into herbarium samples, cuttings, and rooted stems; the latter but two in number: and, owing to the present cold, I cannot tell you more than that they are alive: of the old wood slips nearly all have failed, as expected, but of a few terminal

shoots I have been so fortunate as to strike four, this, by the aid of a hand-glass, and much attention. I have also obtained for you root and branch, as above, two remarkably beautiful *Acanthaceæ*, viz., a *Justicia*, with rich blood colour, or lake whorls of flowers, and a *Ruellia*, with delicate crimson bugles (similar to a *Russellia*) both frequenting the darkest and dampest portions of the forest, and, therefore, *tender*, without doubt, as garden flowers, but your garden will do well enough for them. Two other *Justicia* I shall send you are medicinal bitters of much value: the larger, coarse, with whorls of white bugle blossoms, a fine aromatic, used by the Border Kampteas in their fermented liquors, just as we employ hops; the other and smaller plant has a dull scarlet or red inflorescence, giving it a weedy look, and it is common enough in all woody places: used as a *sâg* by the Assamese, and as a bitter tonic by Europeans.

The first mentioned one is, I think, *not Maha teeta* of Bengal, though allied to it. This plant seems to possess great attractions to the wild bison, and it is difficult to find one which has not been bitten within the circle of their haunts. I have not been very successful in obtaining seeds; in my various jungle travels I undergo the anxieties of Tantalus, for all the hanging fruits, pods, and capsules are either green or empty, or decayed. I was priding myself on a gigantic follicle, of cucumber dimensions, the offspring of some superb *Asclepias*, picked up amid the boulders of the Dehong, when, to my disappointment, after two months' anxious examination, it burst, only to disclose several score of fine seeds in a fermented state! I have obtained for you another delightful garden plant, *Labiata* allied to *Ocimum*, an elegant under-shrub, with all the aromatic qualities of that family; and a mass of rose-colored bloom, highly attractive, from its spicy odour, to the surrounding colonies of bees. The specimen is perfectly hardy, no doubt, though it was solitary. The cuttings have all perished, but the main root is alive. Of orchids I commenced a wholesale harvest, but have since discontinued for want of water carriage—neither steamer nor country boats to be had. I shall send you sundry seeds by *dâk banghy* at times, and some cuttings perhaps by the same method; but boxes, cases, or baskets, alas! Now to fruit trees: with some difficulty I have managed to accumulate for you a few seedlings of *Pierardia sapida*, *Garcinia pedunculata*, and *Placourtia cataphracta*, nearly all self-sown, of these three stubborn and delicious trees. I have also set about procuring for you a rarity, the wild leechee of the Naga Hills, known to me only by description, and evidently needing but the gardener's art and a good locale (Bangalore and Deyrah?) to render it a first-class dessert fruit: Assamese

name, *Naga F'enga*. For the last named *desideratum* I am specially indebted to Lieut.-Colonel Hannay.

I have been very successful this season in rearing your American assortment of "squashes:" they could not be finer in their native country. I am in great hopes I shall be able to send you enough acclimated seed for general distribution, with hints for the culture of this most excellent class of vegetables: the bush squash in my garden would surprise you, each small erect plant is bearing ten to twenty delicious gourds, of which two or three are nearly ripe. The large and trailing sorts are all covered with produce also, but they will not come into table use for a very much later period. I have just obtained in a late overland packet some seeds of the new *custard marrow squash*, so highly praised by Professor Lindley in the *Gardener's Chronicle*—they cost beyond their own weight in silver, *i. e.* 6d. per seed: I wish they had arrived with your Squashes in September, for I cannot now sow them till February. I have also obtained, by the same opportunity, the still more costly seed of *Passiflora tacsonia ignea*, the most dazzling of all that gorgeous species. We have *Modecca palmata* (the large tuberous *Passiflora* of our old forests, with fine green foliage, and large buff white flowers). Do you want any? I shall be able before very long to give you some practical hints on coffee growing: besides my old stock, I am now planting out, in this fine foggy season, some 400 more seedlings of sizes.

I find the *Khamar* a very scarce plant; rather local I should say. Dr. Pyster of the Naval Brigade has tried it with success, but he found the same difficulty in getting a good supply of leaves. I am propagating the plant both here and at Suddyah, and shall in time get you a lasting quantity of the same for distribution. It is *not* identical with the dye *Ruellia*, but I have not seen either in flower; as far as appearances go there is a mere alliance. I send you per dāk banghy a small pot of boiled juice, inspissated to the consistence of an extract, and slightly impregnated with turpentine, as a precaution against decay. I have no doubt it will be found to possess the concentrated virtues of the fresh weed in the cure of therapeutic, and other eruptions so peculiar to Bengal. I also forward a small specimen of *Chanda teeta* root, furnished by a pretty little (*Ginchonaceous?*) plant, with coffee-like leaves, and pale terminal inflorescence. The demand for this drug by the Assamese is much greater than the supply, and (except in one spot, amid the Muttuck forests,) I always observed that it had been carefully preserved and planted for officinal use. At Suddyah I have frequently sent out for miles without meeting with it, for indeed, it seems to be the popular

panacea for everything, from jungle-fever down to the itch ! I can speak from experience of its tonic properties *internally*, and its specific curative effects *externally*, and I think I have long ago noticed the plant in a letter. It is a penetrating bitter as you may suppose, not much unlike fresh *Gentian* in flavour. According to the Border Kampteés the *Room* plant is not actually indigenous to Assam, wherever plentiful, there are usually the vestiges of former Kamptee, or Singpho settlements. The use of lime in the dye has the effect of rendering the colour almost *black*. I have some worsted so prepared. The wood ash formula seems conducive to real good *blue*, of the dark military shade. I forward a few seeds: No. 1 taken from the potato-like fruits found in a large forest tree near the Upper Burrampooter, said by the savages to be *edible* when ripe. No. 2 from a delicate leguminous shrub, resembling an *Indigofera*, but I have not seen the flower. No. 3, great bitter *Justicia* of the Kampteés. No. 4, lesser white bindweed, the character that of *Ipomœa rubro-cœrulea*, but flowers are smaller, snow-white, with yellow centre: requires shelter and shade of a forest tree. There is a very fine larger variety, not yet seeded; both common in our jungles.

The mustard crop of this year is a failure in Upper Assam, caused by too much rain at sowing time, and *too little* during growth; with me it flowered when scarce out of the soil ! But my two kinds of Bengal wheat, provided the creatures of *feræ naturæ* will spare them, are most promising, and I am reckoning on eating cheaper bread than eight for the rupee. I send two tubers I just picked up in a clearing in the forest; I think this is the above described *Modecca*.

Bee-keeping is decidedly profitable in Assam. I was surprised when I entered the valley to find the custom unknown. In Kumaon, Nepal, Cashmere, and along the whole N. W. Himalayahs, I observed these insects carefully domiciled; while in Assam the numerous species are only seen in their aboriginal state. Wild bees are abundant in the forests. The best kind seems partial to the abodes of man. I have seen a heavy comb attached to the bottom of an *almirah*, in a *bed-room*, much to the fear of the inmate; that circumstance led me to waylay and ensnare a young swarm on the wing from the above birth-place, and I have since added two more swarms to the "*Apiarium*" constructed of beer chests, under lock and key, in a coal godown. I intend to put some of them into a glazed case soon, so as to learn more of their habits. You know the modern plan of "*chloroforming bees*," I suppose, by which *not one is killed*, and a *child* may take the honey!—*Suddyah, Upper Assam, Decr. 29, 1858.*

The red flowered *Til*, I am sorry to say, has disappointed me at the last stage of growth;—our heavy rains suit its flowering and increasing properties well enough, but then succeeds the great check of cold fogs, and weak sunshine, just at the ripening period; the pods externally look healthy and swelled, but the seeds are little, more than husks. I have a promising patch of maize just now from your American stock, grown one season at Debrooghur. I am putting your late bestowals into the soil as fast as I can. I shall soon send you a few seeds of a most excellent native bean, brought by me from Upper India originally; it is a most prolific vegetable, and unsurpassed at the table by any European or Asiatic species I know of,—however old it may be, yet it boils tender; it is as succulent and well-flavored as squash, or asparagus; Hindoostanee name *gheea seem*. I intend to send you an account of my squashes by-and-bye. I do not see this vegetable mentioned among the good things of your shows. How is this? Is it too common, or is it a failure? Nothing can surpass the luxuriance of the whole tribe in Suddyah, their fecundity is as remarkable as that of the Tomato. The *bush squash* is a great favorite here, from the little room it occupies, and the great supply of food it furnishes. I cannot supply the demand for seed and, unless I can ripen some of my own, must monopolise the growth. Have you a cold-weather cucumber in Calcutta (I mean *bonâ fide out-door*, of course,) we have in Assam? I sliced up four of some 6 or 7 inches long each, on Christmas Day, from a native garden. I have also three or four large plants (from what seed, I do not remember) now growing in Suddyah, but they show no signs of flowering at present. This reminds me what a service you will do Assam, if you will undertake so much trouble as to get me all the *Cucurbitaceæ* of Kashmir, the *Brassicæ*, and Tobaccos—all eminently fitted from their aquatic habitat (especially the first-named from the floating gardens) to our mild and moist cold season. I remember two kinds of *squash*, three or four *cucumbers*, the best a long, slender, rich green-coloured vegetable, a famous large melon-like. The *Surda* is a small unmatched water-melon, with deep purple flesh, as sweet as sugar, and as cold as ice. The turnips, called *gobgloo*, rank among the best flavored in the world. There are two or three kinds of Beans well worth getting. The *China Asters* are very fine, indeed, and as common as the earth they grow upon; name *gool kuthdi*. The Cabul *Surda* melon seed is brought down also to Lahore and Umritsur, and I think would grow here as well as it does out of doors in *Ireland*, where a friend of mine brought them to a quality and weight not inferior to those of Cabul, *viz*, nearly 4 pounds in weigh, sweet, and crisp!

I yesterday sent you by dāk three small packets, one of that large white *Ipomæa*, one of white Pulse, one of black mixed do, (both used green as a vegetable by the Border savages, and also as dhāl when dry.) Local name *miri māl*, or the *miris lentil*, a pretty glycine-like creeper of tall growth. I am particularly anxious to introduce here all such tuberous edible roots as are suited to a deep sandy alluvium, with water near the surface, *i. e.* potatoes from all parts, yams, Jerusalem artichokes, &c. &c., also every kind of spice plant, such as *West India ginger*, *capsicums*, &c., and also sugar-cane, which here attains a magnificent growth and quality. The very best citrons I ever saw were growing wild last month on a barren island (of nearly pure sand,) of the Upper Berham-pooter. I should not be believed if I told you the probable produce of that one bush: and its growth was very remarkable for any plant in *Aurantiacæ*, the lower branches trailing creeper-like along the ground, and heavily laden with bunches of ripe perfumed fruits, some weighing more than 2 lbs. a piece, of which I have converted several into candied citron, and can vouch for their delicious flavor. I carried off, besides, as many rooted offsets and shoots as I could obtain, and they are now mostly thriving in my orchard. Would you like to get a specimen of this variety for your garden? It is possible that it may be an improvement on the old kinds: the deep white sand is all it seems to want for its welfare. I am most anxious to get everything in *Aurantiacæ* worth growing, and am devoting a great deal of land in my Debrooghur garden to that particular class of fruits; the China peach (*flat*), and some good plums I shall also value, if you can spare any.

I am just now "hiveing" a large swarm of another kind of bee, a large reddish-brown, and fierce looking, quite different from my two species at Debrooghur; it is decidedly domestic, though, having swarmed spontaneously inside my bullock shed, and even permitting men and animals to walk close under the colony: my large mustard cultivation seems in all instances to have been the bait of attraction, and I recommend all bee-keepers to grow a patch of this, and the two or three kinds of *Ocymunt*, as food for their insects. The common *toolsee*, you are aware, is the plant of which the leaves are used by the gardeners of the N. W. Provinces to rub on their hands and faces when taking honey-combs, and alone constitute the vaunted charm of these apparently magical gentry! The metamorphosis of a lovely nymph into the *toolsee* plant, to escape the persecution of an amorous god, as sung in Indian poetry, doubtless first gave the superstitious mallees an idea of its soothing virtues.

I shall from time to time send you brief notices of our Assamese trees, plants, and flowers, after the manner of the Rev. Mr. Long in your pages, as I have no doubt some of the readers take an interest in these subjects. I shall soon be enabled to send you any quantity of seeds of the large and handsome tree "*Monkey's grief*," and which Colone Hannay tells me is *Careya arborea* (?) if so, is *Careya* abundant with you—or the reverse? I can send you seedlings, too, if desired, when the good days of "Wardian Cases" return to us. *Suddya, Upper Assam, January 19, 1859.*

•I lose no time in sending you two tubers of that handsome edible cucumber (of which you received seeds), *i. e.*, because the Assamese tell me the really good kind for the table is alone to be ensured by these means, and that *seed* is not to be trusted. Also, I send tubers of a very pretty fragrant little orchid (white) common in our low marshy grass plains.

Seed of a pulse used much by frontier savages, and suited to your Bengal cultivation,—also sending other seeds to fill up the little box.

We have had heavy rain, and my wheat is really splendid for a Bengal crop, more than 5 feet high, full in ear. I believe this is the most N. E. point of her Majesty's Indian territory in which it has ever been grown. Most of your maize, too, is above ground, but, as I wrote you, the other seeds have arrived too late.

The *Hulluck* and other perishable seeds I of course transmit per letter.

Hulluck of Assam is a *Terminalia*; of fine, tall, straight, durable timber growth: for common carpentry excellent, and even as a canoe, lasting five years, or more. Lovely when in blossom; one mass of deep rose, or carmine red tiny flowers;—no larger than these seeds,—grows in the vicinity of the great rivers on alluvial soil,—chiefly composed of sand and vegetable deposit. Forests with a dense under-growth seem necessary to its primary increase, and then it speedily overtops and overshadows every thing in its vicinity; ought to do in the greater part of Bengal,—and if not too near the sea.

The large creeper, *Tenga gootee*, looks like a *Smilax*, but not having seen it in flower I cannot speak with certainty; grows on the edges of forests' streams, clinging to the bank reeds, or grasses; berries used throughout Assam as the natural bait for the better kinds of fish, which seem in those localities of its growth to care for little else. I have a number of magnificent terrestrial orchids (3 or 4 feet high,) planted ready for you: these superb plants are only to be found in the most dark and unhealthy forests, and I have therefore availed myself of this dry, healthy period to collect them. You will certainly have to

make a jungle in some wet, dark corner of those picturesque gardens, to meet the *shy* nature of many of my donations.—*Suddyah, Upper Assam, February 6th, 1859.*

March 2. The Great Dihing River, Abor Expedition.—Just a few lines to say that I got your's anent the Munjeet seed a few days ago, and that I lost no time in writing to a friend on the Naga frontier, with the view of obtaining some, if procurable, (if for loan, barter, or money). There is little or none on the Suddyah frontier, and that little is a wretched woody kind of stuff, containing but a minimum of colouring matter. The Naga product is the best I have seen in Assam, but I am told the Bhote frontier (Durrung) furnishes the quantity A 1. I know very little of the subject, so will not trust myself to any further information. I will try and assist you if I can, through Native agency, in procuring seed also from the last mentioned locale. I send herewith three seeds of that pretty shrub wild coffee, which I first noticed as a jungle plant on the Goalparah hills, subsequently in various parts of Upper Assam, and very abundant indeed, where I am just now encamped, on the undulating shores of the Dihing, in a densely wooded tract; the soil, stone, sand, and alluvium.

March 20, Suddyah.—I only returned yesterday from the 'seat of war,' having stayed behind the force for a few days to construct an entrenched post, where we have left a small detachment temporarily to prove to the savages that we intend to 'hold our own.' While engaged in stockading, I amused myself with collecting a few seeds for the Society, and send you herewith a small lot of the *Koroi acacia*,———? the most valuable of all timber (next to teak) to the Engineer and Railway Mechanician, nearly *as hard*, almost as durable, and as *enormous*, and indeed in every way the most desirable as a forest tree of all our indigenous woods. It prefers the alluvial *churs*, the seedlings being nurtured in the dense moist shade of the giant grasses, and rank vegetation of such tracts. We have had so much *unseasonable* rain that I can send you but few sound seeds of *anything*, blight and decay having made sad havoc. I shall, however, be able to transmit another packet or two of sundries very shortly. I collected about a pound of ripe berries of the wild coffee, and had the curiosity to roast and make a *brew* of the same. The powerful medicinal bitter flavour of the decoction forbade my drinking much of the same; it was two *cinchonaceous* by a great deal. The savages of South America, I believe, employ it in the cure of malarious fever in preference to the indigenous bark of *Cinchona*, so precious in our European practice; *probandum est*, I say, and you can have as many young plants and seeds as you choose, to ask for, in the event of your garden not possessing it already.

For a shrubby hedge it is decidedly elegant and desirable, and seems, too, most hardy.

This dreadful thirty days' rain has done for a great deal of horticulture and agriculture at Suddyah, and I can only boast of my "Squashes", a dry March would have made me triumphant with that vegetable, and I must now remain content with a *fraction* of my previous hopes, *viz.*, some—

"Early Bush Squash" (ripe), weight 5 pounds, full of perfect seeds.

"Cocoa Squash" (ripe), weight 11 pounds, full of fine mature seeds as good as those from America.

"Marrow Squash" (ripe), weight 9 pounds, ditto ditto, as above.

Warted Squash, 2 or 3 lbs weight (ripe), yielding only a very few seeds, but these ripe and perfect.

Other squashes (various) from ten to five pounds weight—seeds not yet examined. I would like to have sent you a basketful if we had *Steamers*. I have been most anxious to acclimate this particular class, of vegetable, it being essentially a "poor man's provender" from the productiveness of the plants and small amount of land necessary to grow them. I need hardly tell you that I am beset with applications to furnish the seed—and, indeed, I have been robbed at night of sundry fine ripe specimens.

March 20th, Suddyah.—You will get a small box very shortly with the squash and other seeds, which in our very moist climate I have dried by the very gradual sand process, and which method I recommend to our European importers; the final stage should not exceed *blood-heat* in canvass bags, to enable the operator to prepare any amount without admixture.

I am now reaping my Bengal wheat; in spite of a month's rain and mist, the ears are full and sound, and the crop an excellent one altogether. Some Mishmee savages who saw it, tell me the Ber Abors have similar grain (obtained originally from Lama), and I have directed them to bring me down samples. The same party have brought me a small parcel of *Munjeet*, and I have promised them a fine donation of *country liquor* (the omnipotent key to the savage heart) if they bring me two handfuls of the seed. This they have promised to do, but it does not ripen till October or November, so they tell me. I think I told you that I have written for a small supply to the Naga frontier, where great quantities seem to be produced. I am also trying the *Bhootan* gardens, but here I do not expect success: the whole Thibetan frontier is excessively jealous of its exports, so much so, that they sell only male animals at their fairs, lest we might breed from their stock.

Nearly all the *Cereals* you so liberally sent me were riddled by "Weevils," and I fear two-thirds will not last till next season. Here I beg to suggest another small hint. Import all your agricultural seeds in the *natural* protection—the *husk*. The natives of Upper India are fully aware of its advantages, and you will see their stock of maize, seed, wheats, &c., suspended in bunches from the cottage roofs, in which position, too, they receive ventilation, or *smoke*, the two main preservatives. The bulk of package is a very secondary consideration, I think, compared with the loss of a whole season's sowings, and the consequent disrepute of European seeds among the natives. "

A large percentage of your sorts (American maize) germinated famously, but that farmer's curse, the "Mole Cricket" (*Gryllotalpa*), has devoured nearly every one of some kinds, and more than two-thirds of others: this minimum produce, however, is remarkably fine; both soil and climate are well suited to the growth, and I am daily receiving applications from the frontier savages to give them seed. I find that the middle of December is the proper period for sowing this description of grain, but your box arrived too late, and I had only a supply raised from home acclimated (American), wherewith to try the experiment. Of this batch not a plant was eaten, for the abominable insect seems to hibernate, and to that circumstance I attributed my promising crop of the cold season's sowing: it is now entirely covered with green "Cobs," some of them full a foot long. Your Grass seeds are now germinating well in the trial gumlows; "Red Clover" and "Lucerne" the fourth day from time of sowing. Are these two acclimated? You may judge of the legion-like voracity of the mole-crickets, when I tell you that in the eighth of an acre a digging party of boys earned in two days nearly 3 rupees, at 6 *crickets* for the pice.

I found this experiment so expensive and so ineffective, that I have abandoned it, and must look to other modes of extirpation, which I will duly report to you. Their subterranean habit, descending to three and four feet, and only feeding by night, render these pests as bad as locusts, and they breed incredibly. Nearly all my fine annual cabbage plants, seedlings, shrubs, capsicums, tobacco and ginger, indeed, three-fourths of everything, have been nocturnally chopped to pieces, and dragged into their burrows, and I have been all but disheartened by their attacks.

The country people of this district are compelled to shift their cultivation from time to time through the above cause, for the more you clear the surface of the soil, the more do these pests multiply and devour: on lands covered with rank vegetation, or high jungle, they do not remain, but shift to the open plain, for some delightful reason of

their own. The sun kills them instantly, and they die very soon after you bring them to daylight, so that I think a heavy sub-soil cultivator, suited to elephant draught (or two pair of large bullocks), might possibly annihilate them; and once above ground they form a favorite food to all manner of birds: indeed, when full grown and winged, to the Assamese themselves, who relish them, as we English do our *prawns*. At Debrooghur they are comparatively scarce, but that does not mean *few or far between*, or *harmless* exactly. I have collected a few more seed for you; among them a lot of *Hibiscus (fragrans)*; a small tree common to our jungles, flowers on panicles, delightfully fragrant of honey and most attractive to the wild bees:—the fibre excellent for string purposes: the Assamese name *Bun Kupas*, literally jungle cotton, but by this name they call two or three other plants of the same order, and cause confusion. In no country of the world do there seem to be so many fibrous substances and I am collecting specimens of these particular products for transmission to Europe, and you can have the duplicates if you wish. The *Oodal (Sterculia)* I find the most generally useful to me as an agriculturist, and shall send you seeds in season: elephants and wild buffaloes are snared with the cordage of this fibre, so you may imagine its great strength: I use the fresh strips for all purposes of Basts and the tying of fences and enclosures; I find the tree furnishes just now a fine white gum, which seems sufficiently adhesive for common use. Some of the Allumdie Mishmees have brought me down bags made of a jungle fibre which I will ascertain; they are made to hold small supplies of grain, salt, &c., as required by these wandering people. I will send you one with the “Munjeet.” Those large terrestrial orchids from the forest seem to stand removal and exposure famously, they are all now flowering on an open spot, in spite of the foliage having perished, although the spikes were almost in bloom when the plants were transmitted. The unusually heavy rains, perhaps, have contributed to preserve them.

My mode of packing bulbs, tubers, &c., by overland. If only a few very choice kinds, put them up with proper marks tallying with the letter of advice in small canvas bags (*carpet-work canvas, like a sieve*), prepare a light pasteboard box with tightly fitting lid (an old envelope case I found excellent), punch holes in this on all sides, half a dozen altogether, with a common hole punch for leather, then pack the little bags in dry sawdust, or old moss, sewing up the box in a piece of coarse linen, attaching a leather label for the direction. Out of the above 8 tuberose bulbs 7 reached me at Suddyah in a sprouting state, although they had been delayed in Calcutta for a month or two, they

were certainly not less than four months on the long journey from London. Seeds' also forwarded in the same manner have always reached me in great perfection, nearly every one for the last ten years has germinated, but the bags are usually put up in letters, and are made of coarse gauze for lightness. I never lost but one packet, and that arrived in the midst of the cold weather rains, a mass of mould and rotteness, the result of some smoking peon's "hour of idleness," no doubt. Cuttings of fruit trees were sent me at great expense, but all packed after the prevailing fashions entirely failed. Doubtless a large Society like ours would find it best economy to have a Wardian case tightly packed with as many cuttings as it would contain; the more together the better, perhaps, for their freshness: a neat work of wire effectually guarding the case from any accident *en route*.

March 25th, Suddya.—Many thanks for your last despatch and the promised seeds, &c. I am making you up another dâk packet of newly ripened seeds, *viz.*, the arboreous Hibiscus? (*Hibiscus fragrans*), called here, like many other things of the same order, *Bun Kupas*: this small tree furnishes a good fibre, its flowers are beautiful, and are the favorite resort of all bees; cultivation would doubtless improve it. In certain localitiës it forms a small forest. I also send you a few seeds of a shrubby URTICA-looking thing, perhaps a wild *Morus*: this also seems to contain fibrous material, but is mostly remarkable for the fine fiery hue of its orange fructification, only seen in the most dense forests.

I have also obtained for your Museum, grain bags and striped canvas said to be manufactured from *Urtica crenulata*, called here *Sir-nat*. It ought to be named, I think, "*Travellers' Terror*," for often in forest excursions man and beast suffer fearfully from its stings; the inflammation lasts for days together, and the slightest touch of water to the part gives a sensation of hot iron or hot oil! The other and less venomous nettles, called *Bichoo*, literally "*poison touch*," are also used for the same purposes. The above fabrics are brought down annually by the "Cropped-hair Mishmees" of the Dehong, as also are some very prettily designed cotton pieces of a coarse web, used as clothing, jacket, &c., by the Assamese; you will get samples of all these by-and-bye. I am also preparing a little twine of the *Bun Rhee*a, or indigenous *Boehmeria* of our forests, rivalling the *Sir-nat* in height and size. Lastly of *Pæderia fatida* (*Rubiaceæ*). Assam could turn out millions of tons if required to do so. From the Gowalparah district to the foot of the Abor mountains, high up the Burrampooter and Dihing, this weed forms the chief undergrowth of the jungles, and constitutes

a natural network of creeping foliage, rendering the advance of any human being on foot an *impossibility*! Elephants, their riders armed with the *dáo* or north-eastern war-knife, are the sole pioneers on such occasions, and even then the progress is but slow and uncomfortable, while the odours from the bruised *Pæderia* are perfectly in keeping with its classical epithet. I am sending you a few seeds for trial, but I suspect the Sunderbuns have more than enough to spare. I will dry some specimens when in flower. Our Assamese orchids begin to look lively. I am thinking, some of the rotten old trees, just now sparkling with these floral gems, would startle the Londoners if suddenly sent to Covent Garden market! That fine one allied to *Dendrobium cærulescens* will shortly bloom in all its grandeur on the Mishmee war-path, where none but the well armed backwoodsman dare venture to view it, and it is so with most of the finer and rarer kinds which “waste their beauty on the desert air,”—“and die with civilization,” as I said to myself on seeing a clearing lately opened out near the military road, where numerous felled trunks covered with dry orchids lay ready for burning. I have been timber-hunting this last cold season in the beds of both the Burrampooter and Debong (the Dihing which holds all the finer kinds is just now an enemy’s country). In the first named I found a profusion of superb pine,—*Koroi acacia*,—and many other very useful and durable kinds, all in drift, and evidently of great age. On the Debong I found some noble growing specimens of *Cedrelus toona* and *Terminulia*, &c., &c. The Bonger Abor savages of this river also brought me down 2 magnificent canoes, one of *Lauras sassafras*, 40 feet long, and one of a beautiful *Cedrela*, much smaller: the wood of this latter was exquisitely veined, and marbled like mahogany: I much regretted that such valuable wood had been sacrificed to so common a purpose. The *L. sassafras* timber is so highly valued that I had to pay Rs. 44 for the large canoe, and it was considered even in the jungles as dirt cheap. I have just finished raising a splendid tree from a quicksand of the Koondil, (our Suddya streamlet of Hindoo classical fame,) it cost me a lot of personal superintendence, and four days’ labor of sundry carpenters and coolies: not until I dammed and diverted the river did I succeed in chopping the giant into four pieces, and pulling them out with ropes and levers; this mast-like log was straight as an arrow for more than seventy feet, and for a third of its length four feet in girth, the color bright yellow, on cutting, but changing to dark brown almost immediately: grain very close, handsomely veined, fibrous, tough, and elastic, and evidently some *Terminulia* (perhaps allied to *Bhola Terminulia*). But few of our native woods are elastic,

and I had long sought in vain for such a quality. The Assamese here call it "*Hukun*," and say it drifted originally from the Mishmee Camer Range, which is its habitat. I am busily engaged in preparing a collection of woods for the Museum at Kew, in conformity with a circular I lately received from Sir W. Hooker; also one of fibrous plants, and their products, dye-substances, and drugs, &c. This is necessarily a work of time, but I shall manage it gradually by instalments. Any woods which you may not already possess, I shall be happy to give you. It is a pity that "*Xylogy*" is not better conducted. To render such samples of value, the respective specimens of timber should be accompanied by dried foliage, both in bloom and in seed, to prevent doubts and manifold mistakes. I much fear your liberal despatch of maize arrived too late for any produce, this sultry weather is forcing several of the young plants into premature flower, while those (from acclimated) mentioned to you in my last, as sown 15th December, are in famous bearing condition.

I was much amused the other day in my village rambles by a vegetable curiosity, "a family tea plant;" now I will explain. On a sandy chur of this vicinity there dwells an Assamee zemindar who, among a general collection of fruits, pot-herbs, and greens, has a solitary bush, and a remarkably healthy one, of *Thea Assamica*. This individual and his numerous progeny delight in washing down their opium with a cup of the harmless beverage, just as the Chinese do, and they gather the leaves as they require them, merely putting them through an extempore process of hand-rubbing, drying, and boiling, and strange to say that the aforesaid plant is thriving, and covered with nice young leaf in spite of the greedy gatherings in the sandy soil! There is a considerable plantation near me of the *room* dye plant, belonging to a small colony of Kangongs, a border race of Kamptee descent, and they are now dyeing some blankets for me both European and Thibetan. With these people, both male and female, *dark blue* wearing apparel seems to be the prevailing colour, as with their neighbours the Chinese. I observed the other day in the head-dresses of some mountain Abors who came down to me, a plume of goat's hair of brilliant orange colour, evidently dyed with *munjeet*, as are the common scarlet ones usually worn by these people (the Nagas), and was told they procured all these from the Lama country.

*On the Mammoth-tree of Upper California: By BERTHOLD SEEMANN,
Ph.D., FLS.*

When, at the conclusion of the Mexican war, Upper California was ceded to the United States of America, a report that the newly transferred territory was teeming with gold suddenly changed lonely forests into busy mining districts. Exploring parties of adventurous immigrants spread over the face of the whole country, and many a valley and creek never before trodden by the foot of the white man was visited, in hopes of reaping there an abundant harvest of the precious metal. Stories of most wonderful discoveries soon filled every newspaper, some of which proved utterly fictitious, while, again, others seemed to bear out the old adage that "truth is stranger than fiction." But, as often happens, fiction was in many instances implicitly believed in, whilst the sober truth was absolutely rejected. Among the statements which shared the latter fate, was that of an adventurous Californian, who, penetrating into the recesses of the Sierra Nevada, had met, near the head-waters of the Stanislaus and San Antonio rivers, with a grove of trees, rivalling, if not surpassing in height, the highest buildings in the universe. So little, indeed, was it believed, that even the name of the discoverer is not known, unless we accept a Californian tradition, which points to J. M. Wooster, and is so far borne out by actual evidence, that there exists on one of the trees, now termed "Hercules" by the people, the inscription of "J. M. Wooster, Ju. 1850." Soon afterwards, this extraordinary grove, which henceforward obtained the name of "the Mammoth-tree Grove," from the vegetable giants being called the "Mammoth-trees," was visited repeatedly, and the accuracy of the rejected statement was ascertained beyond a doubt. Strangers from all parts of the country now thronged to the place, making it quite a fashionable resort of Californian society, and inducing Mr. Wm. W. Lapham to establish there, as early as July, 1853, a hotel, with all the comforts the nature of the country would admit of. About the same time Mr. William Lobb, the botanical collector of Mr. Veitch's Nursery at Exeter and Chelsea, visited the grove, and did not fail to procure leaves, cones, specimens of the wood, and an excellent sketch of one of the trees (drawn from nature by Mr. Wm. W. Lapham). These materials, having been transmitted to England, were placed at the disposal of Dr. Lindley, who thought he recognized in them a new genus of *Coniferæ*, on which he conferred, in commemoration of the Duke of Wellington, and in consideration of the huge size of the tree, the name of *Wellingtonia gigantea*.

It was supposed, at the time, when the first scientific accounts were published in England, that this tree might possibly be identical with a *Taxodium* described by the unfortunate Douglas, in one of his letters to Sir William J. Hooker (Bot. Mag. Comp. ii, p. 150), as imparting to the mountains of California a most gloomy appearance, and attaining the height

of 300 feet. Douglas had transmitted no specimens with his account ; but a barren branchlet of *Pinus* (*Abies*) *bracteata*, Don, was thought by Sir W. J. Hooker to be part of the plant alluded to, and figured by him in the *Icones Plantarum*, t. 379, as *Taxodium sempervirens*. This mistake was afterwards corrected by the author of it himself, but unfortunately not until Endlicher (*Synopsis Coniferarum*, p. 198) had founded a new species of *Sequoia* (*S. gigantea*, Endl.) upon this figure, with which he also coupled Douglas's account. The referring of Hooker's figure to its proper species (viz. *Pinus* (*Abies*) *bracteata*, Don.) left it again doubtful to which plant Douglas's account referred, and justified in a measure the supposition of Dr. Lindley and others, that it might possibly apply to the newly discovered Mammoth-tree ; but this supposition has not been verified. Douglas, in saying, "The great beauty of Californian vegetation is a species of *Taxodium*, which gives the mountains a most peculiar, I was almost going to say awful, appearance—something which plainly tells us we are not in Europe," evidently alludes to rather a common plant, such as the Redwood (*Taxodium*, or now *Sequoia sempervirens*) really is in the mountains of Upper California ; he cannot possibly speak of the Mammoth-tree, as that, if not confined to the grove called after it, is at all events very local. We are, besides, furnished with a historical proof that Douglas's account does not relate to any other plant than the Redwood (*Sequoia sempervirens*, Endl.) Mr. W. Lobb, who avows himself perfectly familiar with the route followed by Douglas, has shown (*Gardeners' Chronicle* for 1854, p. 22,) that that enterprising traveller was not within 120 miles of the Mammoth Grove ; and in the other localities in which the tree has as yet been discovered, it has not been found attaining the height which Douglas records. We may therefore fairly conclude that Douglas did not see the Mammoth-trees, and that until the year 1850 these monsters of the vegetable creation were totally unknown to Europeans.

The generic name of *Wellingtonia* did not meet with approbation in the United States. The Americans would have felt more pleased if George Washington, the father of their great Republic, had been commemorated in the nomenclature ; and they even commenced in their newspapers an agitation against the adoption of the name "*Wellingtonia*," quite ignoring that the savans of their country bow to the same code of scientific laws which govern the conduct of their European brethren, and that no amount of popular clamour could cause the right of priority here at stake to be set aside. When, therefore, Dr. Winslow exhorted his countrymen, in grandiloquent language, to call the Mammoth-tree, if it be a *Taxodium*, *T. Washingtonianum*,—if a new genus, *Washingtonia Californica*,—he simply proclaimed to all the world that he knew nothing whatever of the laws governing systematic botany. The genus *Wellingtonia* would have suffered nothing from this and similar attacks, if otherwise it had enjoyed a firm foundation. Such, however, was not the

case. When more perfect specimens of the tree than were (in 1853) at Dr. Lindley's disposal came to hand, it was found that the Mammoth-tree (*Wellingtonia gigantea*, Lindl.) presented the same generic characters as the Redwood (*Sequoia sempervirens*,) Endl.) and that consequently *Wellingtonia* must henceforward be considered merely as a second species of *Sequoia*. As far as I am aware, there are only three botanists who have maintained, in print, the untenability of the genus *Wellingtonia*—Torrey, Decaisne, and myself. Torrey seems to have been one of the first who received specimens of the tree, and who arrived at the conviction that he had before him a new species of *Sequoia*. But he refrained from publishing it; nor did he, after the institution of *Wellingtonia*, make it generally known; he communicated it, however, to several of his friends, among them Asa Gray; and it was the latter who first stated, in the "American Journal of Science and Arts," (Second Series) Vol. xviii, p. 286, that Torrey had given to the Mammoth-tree the name of *Sequoia gigantea*; and in August, 1855, Dr. Torrey made to the American Association for the Advancement of Science a communication to the same effect. This remark is the more necessary, as Dr. Torrey, in the "Report on the Botany of Whipple's Expedition," (Washington, 1857), p. 84 [140], refers to a paper of his, in "Silliman's Journal," on the subject, which would naturally lead us to expect that the name had there been published by him. But such is not the case, as a careful search of the said journal, and a conversation with Dr. Torrey during my last visit to New York (1857) enable me to state. The first time that the name of *Sequoia gigantea* occurs in Dr. Torrey's own writings is in the Report just quoted, where, after alluding to Dr. Bigelow's Report (not yet received in Europe?) for a full account of the tree, he says:—"We have shown that in this tree, as in many species of *juniperus*, the leaves are dimorphous; we have also proved that there is no generic distinction between the two trees (viz. *S. gigantea*, Torrey, and *S. sempervirens*, Endl.) The male aments of *S. gigantea*, which were not known to Lindley and Hooker, prove to be in all respects like those of *S. sempervirens*." Torrey's views were borne out by Decaisne in a communication to the Botanical Society of France (Bull. de la Soc. Bot. de France, i. p. 72, 1854). Finally, after examining the specimens in the Museum at Kew, and some that had come into my possession, I stated that *Wellingtonia* was a congener of *Sequoia sempervirens* ('Bonplandia,' iii. p. 27, in adnot. Jan. 15, 1855), at the same time changing the name into *Sequoia Wellingtonia*, Seem. The time has now arrived when it must be decided which of the three names (*Wellingtonia gigantea*, *Sequoia Wellingtonia*, or *Sequoia gigantea*) is to be adopted. After every doubt respecting the generic identity of the Redwood and the Mammoth-tree has been dispelled, there cannot be two opinions about the retention of the name *Wellingtonia gigantea*; it must be given up, and one of the others take its place. My reasons for rejecting the specific name "*gigantea*" were to avoid

a possible confusion with that strange compound, the *Sequoia gigantea* of Endlicher, which belongs as a synonym, partly to *S. sempervirens*, Endl. partly to *Pinus (Abies) bracteata*, Don. Torrey not taking this danger into consideration, retained Lindley's specific name, which, under any other circumstances, would have been the only true course to follow. I am fully aware that, by putting *S. gigantea* Torrey (nec Endl.!), and *S. gigantea* Endl. (nec Torrey!), that danger may be guarded against, as is done in numerous instances, and that my name would have no chance of being adopted on that account alone. But it has, besides, the recommendation of enjoying the right of priority; for, as I have stated, although Dr. Torrey was undoubtedly the first who determined the true systematic position of the tree under consideration, he did not publish his name until 1857, whilst mine was published in January, 1855. The synonymy of the Mammoth-tree and its ally, the Redwood, will therefore stand as follows:—

Sequoia, Endl. Synop. Conifer. P. 197 (1847); Gen. Plant. Suppl. iv. pars. ii. P. 7. n. 1808 (1847). *Condyllocarpus*, Salisb. MSS. *Taxodii* Sp., Lamb. 1. *Sequoia Wellingtonia*, Seem.* Bonpl. iii. p. 27, in adnot. (1855).

Wellingtonia gigantea, Lindl. in Gard. Chronicle for 1853, p. 823 (1853); Hook. Bot. Mag. t. 4777, 4778 (1854); Van Houtte, Flor. des Ser. ix. p. 93, t. 892, 893, &c. p. 121, t. 903 (1853-54).

Washingtonia Californica, Winslow in Californian Farmer for 1854; Hooker's Journal of Bot. and Kew Misc. vii. p. 29 (1855).

Taxodium Washingtonianum, Winslow, *Ibid.*; Hooker's Journ. *l.c.* (1855).

Sequoia gigantea, Torrey (nec Endl.!) in Rep. On Bot. of Whipple's Expedition, p. 84 [140] (1857).

* The entire literature of the Mammoth tree is already very voluminous, and, as far as it is known to me, may be here subjoined:—

American Journal of Science and Arts (Second Series), xvii. p. 440; xviii. pp. 150, 286, xx. p. 281; xxiv. p. 440.

Bonplandia, ii. p. 238; iii. p. 27; vi. 343.

Botanical Magazine, t. 4777, 4778.

Bulletin de la Soc. Bot. de France, i. p. 72 (1854).

Flore des Serres et des Jardins, ix. p. 93, t. 892, 893, p. 121, t. 903.

Gardener's Chronicle and Agricultural Gazette for 1853, pp. 819, 823; for 1854, pp. 22 40 118, 134, 373; for 1855, pp. 7, 69, 83, 838; for 1856, pp. 260, 502, 518, 534, 567, 580, 631 642, 694, 726, 742, 774, 790, 805; for 1857, pp. 517, 534, 550, 678, 629, 643; for 1858, pp. 671 686, 702, 717, 733, 814.

Hamberger Garten-und Blumenzeitung, x. pp. 61, 139, 239, 423, 429; xi. p. 120; xii. pp. 35, 489; xiii. pp. 93, 158; xv. p. xv. p. 12.

Hooker's Journal of Botany, and Kew Garden Miscellany, vii. pp. 106, 150, by George L. Trask, 4to. 4 pp. (Two pamphlets issued to the visitors when the bark of the tree was exhibited in the Philharmonic Rooms, Newman Street, Oxford Street, and Adelaide Gallery, Strand, London, and containing numerous extracts from the New York and London newspapers in reference to the tree.)

Report on the Botany of Whipple's Expedition, by John Torrey, p. 84 [140] Washington, 1857.

Nomina vernacula : "*Mammoth-tree*," "*Big tree*," "*Wellingtonia*."

2. *Sequoia sempervirens*, Endl. Synop. Conifer. p. 199 (1847).

Taxodium sempervirens, Lamb. Fin. ii, t. 64.

Taxodium Nutkaense, Lamb. Herb.

Taxodium, sp., Dougl. in Bot. Mag. Comp ii. p. 150 (1836).

Sequoia gigantea, Endl. (nec Torrey!) Synop. Conifer. p. 198 (1847).

Nomen vernaculum : "*Redwood*."

The Mammoth-tree is rather local in its geographical range. True. Carrière states that an officer of the French navy brought cones identical with those obtained in California from a latitude about 10 degrees north of the locality in which it was first discovered ; but as no difference between the cones of *Sequoia sempervirens* (a common tree in that latitude) and *S. Wellingtonia* has as yet been pointed out, the evidence adduced cannot be looked upon as conclusive. More probable seems the statement that *Sequoia Wellingtonia* has been met with in Carson Creek, a few miles northward of the Mammoth-tree Grove, and that of its having been observed in various other parts of the Sierra Nevada, where, however, according to the unanimous testimony of the various accounts, it does not attain those gigantic dimensions we are wont to associate with it. It is beheld in the greatest perfection in the Mammoth-tree Grove situated near the head-waters of the Stanislaus and San Antonio rivers, in the county of Calaveras, latitude 38° N., longitude 120° 10' W, at an elevation of between 4000 and 5000 feet above the sea, and about fifteen miles from Murphy's Camp, the nearest gold-diggings, ninety-five from Sacramento city, and eighty-five from Stockton (by stage route). In visiting the place, the traveller can obtain vehicles and animals at Murphy's Camp, and proceed to his destination by carriage-road, gradually ascending, through a splendid forest of pines, cedars, and firs, here and there dotted with fine oaks. The valley in which the grove is situated contains about 160 acres of land, and, according to Winslow, is a basin of coarse siliceous material surrounded by a ridge of syenitic rock, which in some places projects above the surface. The soil is a rich and very deep-black loam. The climate is delightful. During the summer it is entirely free from the scorching heat of the lower country, the vegetation remaining fresh and green, while the water is as pure as crystal, and almost as cold as ice. The vicinity, we are assured, offers every inducement to sportsmen, many kinds of game abounding, while the brooks teem with excellent trout. Delightful horse-back rides conduct the visitor to the Falls of San Antonio, the basaltic cliffs on the North Fork of the Stanislaus, and other interesting points of scenery and objects of curiosity.

Things are easiest judged of by comparison ; and what proclaims loudly the enormous size of our vegetable giant is its growing in a country as distinguished for huge trees as Kentucky and Virginia are for tall men. Bate-man has attempted more special comparisons, strikingly illustrated in a

series of diagrams which he exhibited in a lecture on the subject at Conington, and afterwards in the rooms of the Horticultural Society of London. One of these diagrams (on the scale of 1 foot to 10 yards) represented a Mammoth-tree 300 feet high, and a ladder of a common length, with a man half-way upon it, leaning against the trunk : by comparison the ladder assumed the appearance of a walking-stick, the man that of a beetle. More fully to illustrate these extraordinary dimensions, sketches had been drawn of some of the tallest buildings in the world,—the Pyramids of Egypt, St Peter's at Rome, Salisbury Cathedral, and St. Paul's in London,—showing that the Mammoth-tree contested the palm with St. Peter's, and was but a small distance below the Pyramids. In a comparison with other trees, the Californian giant came off equally victorious; the highest palm dwindled down to the appearance of sugar-cane, the spruce to that of Juniper, and even the far-famed Cedar of Lebanon to that of a mere bush. A quotation of the absolute height of the *Sequoia Wellingtonia* is equally calculated to impress us with amazement. Most of the specimens now standing at the Mammoth Grove attain the average height of 300 feet ; but one of them—known as the “Mother of the Forest,” and stripped of its bark to the height of 116 feet, for the purpose of being publicly exhibited—actually measures 327 feet in height, and 90 feet in circumference ; or if we are disposed to credit the statement put forward by the exhibitor of the bark in New York and London, its full height is 363 feet, diameter at base 31 feet, and diameter 100 feet from the base, 15 feet. Enormous as these dimensions may be, they are as it were put in the shade by remembering what those of another tree must have been when in full vigour. This “Father of the Forest,” as the specimen has been appropriately termed, measuring 112 feet in circumference at the base, can be traced 300 feet, where the trunk was broken by falling against another tree : it here measures 18 feet in diameter ; and, according to the average taper of the other trees, this giant must have been about 450 feet, and was no doubt one of the highest vegetable forms of the present creation.

Other Coniferæ often attain an enormous size, as for instance the Red-wood (300 feet), or the *Pinus Lambertiana*, Dougl. (150, 200 feet, and more) ; and some of the Gum-trees of Van Diemen's Land are 215 feet high ; but they are all topped by a fully developed Mammoth-tree. The mind involuntarily asks how many years were requisite to pile up such mountains of vegetable cells, and begins to speculate on the possible age of such monsters. When the Mammoth-tree first came into notice, it was assumed to be 3000 years' old ; or, in the editorial language of the ‘Gardeners' Chronicle,’ “it must have been a little plant when Samson was slaying the Philistines or Paris running away with Helen, or Æneas carrying off good Pater Anchises upon his filial shoulders.” Subsequent investigations, however, have proved his assumption to be erroneous. The *Sequoia* under consideration is evidently

a fast-growing species, performing, according to the careful observations made by J. Reed of Peterborough, its growth between 6 P. M. and 6 A. M., and retarding and increasing in proportion to the warmth of the night. Plants raised from the seeds brought to England towards the end of 1853, had already in 1857 attained 6 feet in height, thus having grown in every year about $1\frac{1}{4}$ foot; so that if they continue growing at the same rate, it would require two hundred years to produce a tree 300 feet high. But it is a well-known fact that the growth does not proceed at such a uniform rate; and no process except that of counting the annual layers of the trunk can be applied for the purpose of computing the age of these trees. Asa Gray, in a paper on the age attained by the largest known trees, has attempted to do this; unfortunately, the section of the trunk exhibited at Philadelphia, and supplying him with the principal data, was not that of the *Sequoia Wellingtonia*, as he at the time believed, but that of the *Sequoia sempervirens**; and it is probably owing to this mistake that the scientific public

* By carefully bearing in mind that the trunk exhibited at Philadelphia was that of *Sequoia sempervirens*, and not that of *S. Wellingtonia*, Gray's article, weeded of all matter arising from the confusion of the two species, may still be made to bear indirectly upon the questionable age of the Mammoth-tree. This I have attempted to do in the following. Gray says:—"The size of this tree is such as to give it a presumptive claim to rank amongst the oldest of the present inhabitants of the earth, its length being (on the authority of the proprietor of the section) 322 feet. . . . This section was taken at the height of 25 feet from the ground, and, according to the measurement of my friend Thomas P. James, Esq., of Philadelphia, it is about $12\frac{1}{2}$ feet in diameter, including the bark. Mr. James, at my request, has taken a careful measurement of the wood itself, excluding the bark. The three diameters taken by him respectively measure 9 feet 6 inches, 10 feet 4 inches, and 10 feet $10\frac{1}{2}$ inches; the average diameter of the trunk, at the height of 25 feet from the ground, is a little over 10 feet 3 inches. . . . The section of the trunk at Philadelphia has been hollowed out by fire and other means to a shell of 3 or $4\frac{1}{2}$ inches in thickness. Of this I have, through the kindness of the proprietor and of Mr. James, a piece of the wood, including nearly 3 inches of this section. What is now wanted, and what, unfortunately, I do not possess, is a foot or two of the wood from the central parts of the tree,—a desideratum which may doubtless be supplied hereafter. The data at hand, however, will suffice for determining an age which the tree cannot exceed, unless it be supposed to have grown more slowly during the earlier 9/10ths of existence than during its later years, which is directly contrary to the ascertained fact in respect to trees in general. Now, the piece of wood in my hands exhibits an average of forty-eight layers in an inch. The semi-diameter of the trunk at the place where it was taken is about 5 feet 2 inches. If the tree increased in diameter at the same rate throughout, there would have been 2976 annual layers, which, allowing twenty-four years for the tree to have attained the height of 25 feet, would give it an age of 3000 years from the seed. This corresponds so closely with Dr. Lindley's estimate [of *Sequoia Wellingtonia*!], that we may suppose him to have employed equivalent data in a similar manner. How great a deduction must we make from this estimate, in consideration of the greater thickness of the layers on a younger tree? The only direct data I possess bearing on this point are derived from a piece of a transverse section, $\frac{1}{2}$ inches deep, of a 'rail,' which the exhibitor says was taken from the trunk at the height of 275 feet from the ground. As its layers, on a breadth of nearly $\frac{3}{4}$ ths of an inch, show only a slight curvature, it must have come from a part of the trunk still

still fancy the age of 3000 years, originally allotted to the tree in question by vague computation, may still be considered as correct,—quite overlooking that Dr. Torrey, counting the layers on a complete radius of another trunk, about the genuineness of which there was no doubt, has furnished the following data :—

“The 1st hundred layers occupy a breadth of $17\frac{1}{2}$ inches.

2nd	”	”	”	14	”
3rd	”	”	”	$12\frac{1}{2}$	”
4th	”	”	”	13	”
5th	”	”	”	$16\frac{1}{2}$	”
6th	”	”	”	$8\frac{3}{4}$	”
7th	”	”	”	$7\frac{3}{4}$	”
8th	”	”	”	11	”
9th	”	”	”	10	”
10th	”	”	”	11	”
11th	”	”	”	$11\frac{1}{2}$	”

several feet in diameter. On this section, the exterior inch nearly all alburnum, contains 90 layers, the next 60, the next 45, the remaining half-inch 16, making 32 to the inch. That the exterior layers should be thinner at this height than more near the base of the tree, is just what would be expected. If we apply this ratio of decrease of the number of layers to the inch as we proceed inwards to the section of 25 feet from the ground, we should, at 4 inches within that part of the circumference which I have examined, have only seventeen layers to the inch, which, taken as the average thickness, would make the tree only $1034 + 24 = 1058$ years old. But it is not probable that the thickness of the layers increases so rapidly. The data we possess on other trees go to show that a tree, after it is 400 or 500 years old, increases in diameter at a pretty uniform rate for each twenty additional years, on the whole, although the difference of the thickness of any two or more contiguous layers, or the same layer in different parts of the circumference, is often very great. Still, when we consider how very much thicker are the annual layers of a vigorous young tree than of an old one, perhaps we should not be warranted in assuming more than the average of seventeen layers to the inch for the whole section. Some useful data may be obtained from a tree more nearly related than any other to those of California, though of a different genus, namely the so-called Cypress of our Southern States (*Taxodium distichum*, Rich). I possess three sections of different trees of *Taxodium*, reaching from the centre to the circumference. One of these, on an average radius of 27 inches, exhibits 670 layers; a second, on a radius of 30 inches, has 525; a third, on a radius of 22 inches, has 534 layers. The average is 576 layers to a semi-diameter of 26 inches, or about 22 layers to an inch. Half of this growth (13 inches radius) was attained at the close of the first century, while the exterior layers of the oldest specimen were only the 15th or 16th of an inch in thickness. . . . We may safely infer, I think, in the absence of other data, that when the tree in question had attained the size of 26 inches in semi-diameter, it was only 576 years old. If, therefore, we suppose it to have increased at the intermediate ratio of thirty-five layers per inch for the next 26 inches, and at the actual rate of the last century (as ascertained by inspection), namely at forty-eight layers per inch for the remaining 10 inches, we should assign to it the age of 2066 years as its highest probable age. I think it more likely to be shown, when the wanting data are supplied, that the tree does not antedate the Christian era.”—Asa Gray, in *American Journal of Arts and Science*. Second series, Vol. xvii. p. 440 (1854).

The remainder of 20 layers occupies over 1 inch : 1120 layers on the semi-diameter of 135 inches, or 11 feet 3 inches. We have ventured to reduce by more than one-third the accredited statement or estimate that this tree was 3000 years old. The facts show that the tree lacks almost three centuries of being half as old as it was said to be ! Its enormous size is owing to its continued rapid growth rather than to any extraordinary age. The Mammoth-tree, therefore, so far from having been a contemporary of the unhistorical personages whom Homer's immortal songs have made famous, has sprung up in quite a historical epoch—a few centuries after the commencement of the Christian era ; and, moreover, its still considerable age is equalled, if not surpassed, by its congener the Redwood (*Sequoia sempervirens*, Endl.).

The tenacity of life keeps equal pace with the vitality of the tree. One of the specimens in the Mammoth Grove has been stripped of its bark to a height of 116 feet, but, we are assured, without being in the east affected in its growth ; and most of the other specimens there have, in consequence of the fires raging through the forest, or perhaps the fires kindled by the Indians, burnt cavities, a few of which are sufficiently large to admit a person on horseback to enter, and they are moreover 40 feet deep ; but the trees do not seem to have suffered particularly from this. In some of the dead, fallen-down trunks, cavities 200 feet long [caused by age ?] can be traced. The large tree, felled by speculators, put forth several young shoots after it had been felled for some time (Conif. Bonpl. ii. p. 238). Such an almost willow-like tenacity of life is met with in but a few *Coniferae*, and may with justice be counted among the most prominent peculiarities of the *Wellingtonia*.

The wonderful invention and discoveries of our age have in more than one instance outstripped all limits of poetic fancy. By means of the electric telegraph, we have outdone Puck's startling promise to

“ put a girdle round about the earth

In forty minutes ;”

and our Californian giant more than rivals the tree placed by Milton in the hands of Satan as a lance,

“ to equal which,

The tallest pine hewn on Norwegian shores,

To be the mast of some great amiral,

Were but a wand.”

But this very fact, the realization of much that was thought ideal, has engendered and nursed a desire to behold with our own eyes whatever belongs to this category. There probably never was a time in history when “ sight-seeing” was regarded with more favour, or found readier advocates, than the present. Speculators were therefore not backward in making capital out of this state of feeling as applied to the Mammoth-tree. To transport masses

of people to the grove was impossible ; but to transport at least portions of the famous giants to the centres of our great cities, practicable. The latter accordingly, was done ; and the earliest accounts of the Mammoth-tree, which reached Europe were coupled with the sad intelligence that a piece of Vandalism had been perpetrated in Upper California, unexpected in our enlightened days. One of the finest trees of the grove, we were informed, had been felled for the purpose of being publicly exhibited. This individual, was 96 feet in circumference at the base, and solid timber. The work of destruction commenced by boring with augers and sawing the spaces between,—a labour engaging twenty-five men for five days. But when this was done, the tree was found to stand so nearly perpendicular that it would not fall ; and it was only by applying a wedge and battering-ram, during a strong breeze, that the trunk was finally upset. In falling, it convulsed the earth, and by its weight forced the soil from beneath it, so that it lies in a trench ; and mud and stones were hurled near a hundred feet high, where they left their mark on neighbouring trees. The hole forms the bed for two bowling-alloys. A section of 2 feet long taken from the stump, also a portion of bark, were both exhibited. The latter was put up in a natural form, and constituted a spacious carpeted room, containing a pianoforte, with seats for forty persons. On one occasion 140 children were admitted without inconvenience. The surface of the stump, still remaining in the ground, is smooth, and affords ample space for thirty-two persons to dance, it being 75 feet in circumference ; theatrical performances have also been given upon it on various occasions. It is covered by a rustic arbour, and connected by a floor with the Mammoth-tree Hotel, founded by Mr. Lapham, to whom we are indebted for much valuable information respecting the plant under consideration. The success with which the public exhibitions of these specimens in San Francisco, New York, and Paris had been attended, induced, in 1854 another speculator to strip a second magnificent tree, called the “Mother of the Forest,” up to a height of 116 feet, of its bark, fortunately without affecting by this ruthless process the vitality of the tree. It required the labour of five men ninety days. During this time a person had a fall of 100 feet from the scaffolding, and, curiously enough, escaped with a broken limb. The bark was removed in sections 8 feet in length, and each piece marked and numbered, so that it could be put up in precisely the same position that it occupied on the tree. It was then, after being carted eighty miles overland, shipped down the river to San Francisco, and thence on a clipper vessel around Cape Horn to New York, where, after being exhibited for a season in the Crystal Palace, it was transmitted to London, and was for the first time on view, April, 1856, in the Philharmonic Rooms, 14, Newman Street, Oxford Street, and afterwards at the Adelaide Gallery, Strand. But both of these localities were too low to admit of the whole section of the stripped

bark being put up ; nor, indeed, was there any other available building in the British metropolis could serve the purpose. Fortunately the Crystal Palace at Sydenham possessed the necessary height ; and ever since the autumn of 1856 the whole of the bark, to the height of 116 feet, has there been exhibited. The interior is fitted up with a table, chair, and other furniture, and forms a large and spacious drawing-room. Daguerreotypes and photographs of the tree and grove can also be seen, together with living specimens of the species ; and if this exhibition on the one hand fills us with regret at the Vandalism of mercenary men, it on the other brings home to us the prodigious power of American vegetation.

It was at one time feared that not many years would elapse before the last vestige of the Mammoth-trees would be destroyed. It was the 'New York Herald' which, on the 17th of December, 1854, first pleaded for their protection. "We say," argued the 'Herald,' "that Congress should interpose, upon the presumption that these trees are public property, are on the public lands of California, and because Congress has already interposed to protect the public Live-Oak (*Quercus virens*) forests of Florida from the rapacity of unscrupulous speculators..... We repeat that it is the duty of the State of California, of Congress, and of all good citizens, to protect and preserve these Californian monuments of the capabilities of our American soil." In Europe, the danger in which the trees were placed was viewed with equal apprehension, inducing a correspondent of the 'Gardeners' Chronicle' to suggest that a petition of the scientific men might be sent to the American Government, praying for the protection of this eighth wonder of the world. Fortunately the authorities were fully alive to their duty, by prohibiting the removal of any tree under any circumstances whatever, and thus, by throwing the sanctity of the law around the hallowed grove, preserved to North America an object quite equal in grandeur to the famed Falls of Niagara, the Mammoth Cave of Kentucky, or the Natural Bridge of Virginia.

The number of large specimens still standing in the Mammoth-tree Grove amounts to ninety-two, nearly all of which have received from the people some appropriate and romantic name. A few of the most prominent it may not be uninteresting to describe. After leaving the hotel, and proceeding into the forest by the upper trail, we are at once struck with the magnitude of the trees, and passing several immense specimens, we reach the "Miner's Cabin," measuring 80 feet in circumference, and attaining 300 feet in height. The "cabin," or burnt cavity, measures 17 feet across its entrance, and extends upwards of 40 feet. Continuing our ramble, admiring the luxuriant growth of underwood, consisting of firs, cedars, dog-wood, and hazel, we come to the "Three Graces." These splendid trees appear to grow, and perhaps do grow, from one root, and form the most beautiful group in the forest, towering side by side to the height of 290 feet, tapering symmetrically from their base upwards ; their united circumference amounts to 92 feet ;

it is 200 feet to the first limb on the middle tree. The "Pioneer's Cabin" next arrests our attention, rising to the height of 150 feet (the top having been broken off), and 33 feet in diameter. Continuing our walk, we come to a forlorn-looking individual, having many rents in the bark, and withal the most shabby-looking in the forest: this is the "Old Bachelor;" it is about 300 feet high and 60 feet in circumference. The next tree is the "Mother of the Forest," already mentioned as having been stripped of its bark by speculators in 1854. We are now amidst the "Family Group," and standing near the uprooted base of the "Father of the Forest." This scene is grand and beautiful beyond description. The venerable "Father" has long since bowed his head in the dust; yet how stupendous even in his ruins! He measures 112 feet in circumference at the base, and can be traced 300 feet, where the trunk was broken by falling against another tree. A hollow chamber or burnt cavity extends through the trunk 200 feet, large enough for a person to ride through. Near its base is a spring of water. Walking upon the trunk, and looking from its uprooted base, the mind can scarcely conceive its prodigious dimensions, while on either hand tower his giant sons and daughters. Passing onward, we meet with the "Husband and Wife," leaning affectionately towards one another; they are each 60 feet in circumference, and 250 feet in height. "Hercules," one of the most gigantic specimens in the forest, stands leaning in our path. This tree, like many others, has been burnt at the base; it is 325 feet high, and 97 feet in circumference. The "Hermit," rising solitary and alone, is next observed. This tree, straight and well-proportioned, measures 320 feet high and 60 feet in circumference. Still returning towards the hotel by the lower trail, we pass the "Mother and Son," which together measure 93 feet in circumference; the "Mother" is 320, the "Son" a hopeful youth of 300 feet. The "Siamese Twins and their Guardian" form the next group: the "Twins" have one trunk at the base, separating at the height of 40 feet, each measuring 300 feet high; the "Guardian" is 80 feet in circumference, and 325 feet high. Beyond stands the "Old Maid," slightly bowing in her lonely grief; she measures 60 feet in circumference, and is 260 feet high. Two beautiful trees, called "Addie and Mary," are next to arrest our attention, measuring each 65 feet in circumference, and nearly 300 feet high. We next reach the "Horseback Ride," an old fallen trunk of 150 feet in length, hollowed out by the fires which have, in days gone by, raged through the forest. The cavity is 12 feet in the clear in the narrowest place; and a person can ride through on horseback a distance of 75 feet. "Uncle Tom's Cabin" next claims our admiration, being 300 feet high and 75 feet in circumference. The "Cabin" has a burnt entrance of 2½ feet in diameter; inside, the cavity is large enough to seat fifteen persons. Two other trees we must note; one of which, named the "Pride of the Forest*," remarkable for

* In some accounts, "Bride of the Forest." I hold "Pride" to be correct.—B. S.

the smoothness of its bark, measures 280 feet in height and 60 feet in circumference. The "Burnt Cave" is also remarkable; it measures 40 feet 9 inches across its roots, while the cavity extends to the distance of 40 feet,—large enough for a horseman to ride in, and turning round, return. We now reach the "Beauty of the Forest," a tree 65 feet in circumference, fully 300 feet high, symmetrical in form, and adorned with a magnificent crest of foliage. Reaching the road, and returning to the house, we pass the "Two Guardsmen," which tower to the height of 300 feet, and are 65 and 70 feet in circumference, forming an appropriate gateway to this wonderful forest.

The trunk of the Mammoth-tree is very straight, and covered with a bark much resembling that of the Redwood in appearance; it is of a rich cinnamon-brown, and from 18 to 22 inches thick! The wood, when first cut, is white; but it soon becomes reddish, and long exposure makes it as dark as mahogany; it is soft, yet nevertheless of slow decay, and abounds in the red colouring matter soluble in water, from which the Redwood takes its name. The branchlets are round, somewhat pendant, and resemble those of a Cypress or a Juniper. As is the case in a more or less marked manner in most *Coniferae*, not excepting even *Sequoia sempervirens*, there are two kinds of foliage, the same branch often presenting both imbricated and distichous leaves. The leaves are alternate, perennial, in the younger plants oblong-subulate, apiculate or mucronate, semiamplexicaul, keeled at the back, plane within, but with a slightly elevated central ridge; in the older plants they are smaller, shorter, more compact and crowded, ovate-lanceolate, acute. Both male and female flowers present the same structure as those of *S. sempervirens*; the same may be said of the cones; the only difference in the latter being that those of *S. Wellingtonia* are generally a little larger than those of its congener.

The Mammoth-tree was introduced into European gardens by Mr. William Lobb; and in 1853 single plants were sold by Veitch's Nursery for £2 2s.; but since then quantities of seeds have been imported, and there is now hardly a horticultural establishment without one or more representatives of this remarkable evergreen. In England it seems to stand the winter without injury; and even in Germany and other parts of Northern Europe it does not require the protection of a glass-house; so that even in those countries it may become a forest and useful timber-tree. In July, 1856, complaints were heard that, in spite of the most careful culture, a peculiar disease had befallen this new *Sequoia*, in consequence of which the twigs were observed to die off in the same manner as they do in *Crytomeria Japonica*. Horticulturists began to take alarm, and feared that their new acquisition would inevitably be lost; but Dr. Lindley soon discovered that, though the twigs died, the main stem and branches continued to grow vigorously, and that the so-called disease was constitutional, and could not be

looked upon as a sign of ill health, or proof of bad culture. In 1858 it bore ripe fruit in England, under the skilful treatment of Mr. J. Buckle, at Theford. May the Mammoth-tree continue to flourish, and display in the gardens and pleasure-grounds of Europe the same gigantic proportions that render it an object of wonder and amazement in its native valleys of America!--*The Annals and Magazine of Natural History*, March, 1859.

(Friday, the 10th December 1858.)

Baboo Pearychand Mittra, Vice-President, in the chair.

The minutes of the last general and special meeting were read and confirmed.

The gentlemen, proposed at the last meeting, were duly elected members, *viz.* :—

Messrs. Alexander Ross, B. C. S. ; J. W. Maseyk ; P. Augier ; M. W. Townsend ; A. Maclean, B. C. S. ; E. A. Dow ; F. Reid ; C. Connaw ; T. J. Knox, M. C. S. ; G. B. Tayler ; E. H. O'Brien ; Captain H. Raban ; the Secretary for the time being, Artillery, Head Quarter Mess ; and Baboo Sonatun Bysack.

The names of the following gentlemen were submitted as candidates for election :—

C. W. Reade, Esq., Madras Civil Service, Vizagapatam,—proposed by Captain W. G. Owen, seconded by the Secretary.

Dr. R. H. Perkins, Civil Surgeon and Assistant Salt Agent, Hidgelee,—proposed by Mr. Henry Cowie, seconded by Mr. W. G. Rose.

Roy Prasannanarain Deb Bahadoor, Dewan of His Highness the Nawab of Moorshedabad,—proposed by Rajah Ranchand Sing, seconded by Baboo Ramanauth Tagore.

James Rowe, Esq., Merchant, Calcutta,—proposed by Mr. Pat. Johnson, seconded by Mr. Wm. Stalkartt.

R. S. Limond, Esq., Toolseah Factory, Bhaugulpore,—proposed by Mr. W. Landale, seconded by Mr. Thomas Grant.

J. Gow Smith, Esq., Rutenpore Factory, Kishnaghur,—proposed by Mr. J. Forlong, seconded by Mr. F. MacLagan.

Robert Newcomen, Esq., Connanuggur Factory, Kishnaghur,—proposed by Mr. J. Forlong, seconded by Mr. F. MacLagan.

A. Brousmichie, Esq., Hurra Factory, Kishnaghur,—proposed by Mr. J. Forlong, seconded by Mr. F. MacLagan.

John Wienholt, Esq., Merchant, Calcutta,—proposed by Mr. H. Knowles, seconded by Mr. W. Stalkartt.

Captain F. F. Vincent, 30th Regiment N. I.,—proposed by Mr. F. Schiller, seconded by the Secretary.

The following contributions were announced :—

1. Selections from the Records of the Government of Madras, No. 45. Report on the Agricultural Exhibitions in the Provinces in 1857. Presented by the Government of Bengal.

2. Report of the Conservator of Forests in the Madras Presidency ; and a Manual of Accounts of the Forest Department. Presented by Dr. H. Cleghorn.

3. Journal of the Asiatic Society of Bengal, No. 3, 1858. Presented by the Society.
4. Selections from the Bethune Society's Papers, No. 5. Presented by the Society.
5. Seed of a species of *Momordica* from Upper Assam. Presented by Captain W. H. Lowther.
6. A collection of Orchids from the Andamans. Presented by Dr. J. P. Walker, Superintendent of Port Blair.

Nursery Garden.

The Officiating Gardener's monthly report was read, of which the following are extracts :—

“ The seeds of ‘ Kamptie Mahi,’ known in Assam as a species of wild dholi, presented by Mr. Grose in May last, were sown in due course in open ground in the kitchen garden, where they freely germinated, and have now yielded a small but good crop : the plant appears to belong to the *Mucuna* tribe, and, I believe, is known as the ‘ Negro bean.’

“ The seeds of New Orleans cotton, received in October last, from the Manchester Cotton Supply Association, have germinated very favorably. I had sown 100 seeds in three gunlows ; out of the whole, 56 seeds freely germinated, which, therefore, have yielded an average per-centage of 60. Seeing such a good result, I have laid down some seeds in open ground, in two lines, near the cocoanut plantation adjoining the Pernambuco cotton plants raised from seeds presented by the Government of India during the present year.

“ All the vegetable seeds received from England, America, and Cape of Good Hope, are laid down in open ground in the kitchen garden, and the whole have readily germinated, yielding a result equally satisfactory as when reported of their trial sowing, excepting the seeds from Messrs. Gibbs and Co. of London, which I indeed exceedingly regret to say have failed most signally.

“ The Cape peas have been equally as good as the past year, and have most readily germinated, and are now thriving well. The American peas have much redeemed their character in comparison with the last year's result, but the ‘ black-eyed marrowfat’ is unexceptionably good. The ‘ tall sugar’ and ‘ Prussian pea’ take next rank, but the ‘ tall knight marrowfat,’ though not a decided failure, still may be considered unsatisfactory. As to the different kinds of beans, all have proved very creditable, as all have freely germinated. ”

“ As the *Dioscorea batatas* or ‘ Chinese yam,’ received from Mr. Fortune of China, and the ‘ New Zealand yam,’ will soon be in a fit state to be dug

up, and as a good portion may be distributed to members with advantage, it would be necessary, owing to a limited supply of the crop of both, that such members requiring the above yams should have their names registered in order to make an equal distribution of them.

* In the orchard, besides the general stock of all kinds of fruit grafts, are now ready a few of the Mauritius mango grafts, layers of good kind of pomegranates, all kinds of limes and lemons, and guavas, a few seedlings of best kind of papias, cocoanuts of fine healthy kinds, between two and three years old; and a few of the *Callisaccion longifolium*, which is said to yield a very luscious fruit, equal to the litchee; and a few varieties of palms.

"In the flower garden, besides the general collection of all kinds of ornamental trees, shrubs, and climbers, a few *Thuja* *sps.* and *Cupressus funebris* raised from seeds received from Mr. Fortune from China in 1856, a few layers of *Amherstia*, some fine specimens of chrysanthemums, a few cuttings of *Araucarias*, are still available to members requiring them; as also a small number of seedlings of different kinds of annual flowers raised from Gatter's present year's importation; and also a few seedlings of all kinds of cabbages and celery.

"The grains of *Holcus sorghum*, raised from those presented by General Sir John Hearsay, in March last, will be fully ripe within a few days, when they shall be reaped and forwarded for distribution to members requiring them; as also a small collection of bearded paddy, raised from seed presented by Captain Ripley about May last. The grains of *Holcus sorghum* yield a very fine flour, of sweet taste, and make a most wholesome bread, and is always eaten as baked hand-bread.

"In conclusion, I beg to add, that the stump of the *Bambusa gigantea*, now forwarded, is from the specimens of a clump which fell from the effect of the storm of 25th October last: it was reared from cuttings raised from the bamboo received, I suppose, from the late Dr. Wallich in 1813, when Superintendent of the Botanical Garden. This bamboo measured 45 feet in length and 22 inches in width; the shoot sprung up in July last in its usual season, and within the short space of four months it had not only attained that width, but that extraordinary height."

Mr. Manuel also acknowledges a contribution, from the Rev. Mr. Firmininger, of a number of *Ranunculus* and *Oxalis* bulbs, imported by the October mail; and a collection of flower seeds from Captain H. B. Weston, at present in England, which have germinated very readily.

Establishment of a Branch Agri-Horticultural Society at Balasore.

The Secretary read the following communication, dated 4th December (and enclosures), very recently received from Baboo Gourdooss Hysack, announcing

the gratifying fact of the formation of a Branch Society at Balasore, of which he had been appointed Secretary :—

“ I have the honor to communicate, for the information of the Agricultural Society in Calcutta, the proposed establishment of a Branch Society of Agriculture and Horticulture in the district of Balasore.

“ *2nd.*—The address of Baboo Puddolochun Mundul, and the proceedings of a meeting of the inhabitants and residents of the station, held on the 22nd ultimo, herewith submitted, contain an account of the origin and the principles on which the proposed Branch Society is to be conducted.

“ *3rd.*—The list of subscribers given below will show the annual fund just now available, which amount [Rs. 657] it is proposed for the present to apply to procuring from Calcutta, with the aid of your Society, fresh supplies of useful seeds and plants for gratuitous distribution, under certain conditions, among the farmers cultivating any of the products noted in the margin, and the services of professional

Cotton, sugar-cane, potatoes, hemp, flax, and tobacco. *malees*, upon adequate salaries, to direct and superintend the cultivation and growth of the different products.

“ *4th.*—The Code of Bye-laws, previous to its adoption by the Branch Society, is transmitted for submission to, and approval of, your Society, with a request that you will be pleased to send for our instruction and guidance a copy of the Rules that are laid down for the observance of Branch Associations.

“ *5th.*—I am desired also to request that you will be good enough to move your Society to state the nature and extent of the aid and co-operation which they are willing to afford to their Branch institution at Balasore.

“ *6th.*—It is needless to state what our members feel—that the kind co-operation and encouragement of the Parent Society will be the fundamental elements in the success and prosperity of this little sapling.

“ I have, &c.,

“ GOURDOSS BYSACK,

“ *Secretary, Balasore Branch Agricultural Society.*”

Translation of an Address read by Baboo Puddolochun Mundul, on the 1st November 1858.

“It is an auspicious day to us. Her Majesty the Queen of England has assumed the sovereignty of our country. We hail the occasion with feelings of sincere joy and gratitude. We shall cheerfully illuminate our family dwellings this evening, but while we thus rejoice, we cannot but feel the poverty of our demonstration. We are celebrating in a very poor and ephemeral way the advent of a new and happy era in India. We ought to

commemorate the day in a marked and durable manner, and, I think, nothing will be more acceptable to Her Majesty, and more useful to her loyal and devoted subjects in this district, than the establishment of an Agricultural Society in connection with that of Calcutta. You are aware how much we are dependent upon other districts for the supply of some of the common products and necessities of life.

"Cotton (kapas), potatoes, tobacco, and sugar-cane, which we borrow from other places, are annually consumed in the single district of Balasore to the value of upwards of a lakh and a half. Sugar-cane, hemp, and flax already grow here, but, compared to those of Bengal, they are wretched. The soil is sufficiently fertile, particularly in places adjacent to the river, but our products are scanty and unsuccessful. The fault is entirely our own, for we do not see how the products grow elsewhere, and what preliminaries may be necessary to ensure success to cultivation.

"Good seeds, a little instruction in manuring, &c., and a slight encouragement to the successful farmers, are all that we want. If you will co-operate with us, and spend a little money on the experiment, I dare say you shall, ere long, see us successful, and eventually become independent of other districts. We will not only benefit the people by opening up fresh resources to them, but we shall make ourselves more comfortable and happy.

"I am glad to inform you, that, on a reference having been made to the Agricultural Society in Calcutta, I have been assured by the Secretary, that the Society are quite willing to co-operate with us in any practical suggestions we may make in regard to improvements in this district. If we can obtain good seeds, which may be had almost gratuitously from Calcutta, and well-trained *malees* to instruct and superintend our farmers, I am quite sure that, with judicious management, and by bestowal of little gifts in the shape of prizes, we shall be able to achieve considerable success to make our labor yield handsome returns. When the ryots shall once have seen their way clear, they will of themselves cease to molest us in future for aid or advice."

The above address was read in Bengalee by Baboo Puddolochun Mundul to the assembly that had met to hear the proclamation on the 1st of November last. Mr. Schalch, with all the European and some of the principal native gentlemen present, repaired to the tent, and explained to them the important proposition, brought forward by the Baboo, and the claims it had upon the best co-operation of every one interested in the welfare of the district. Everybody seemed to approve of the movement, and Mr. Schalch, at the request of the Baboo and his friends, agreed to be the President of the new Society. But as Mr. Schalch thought it would be informal to proceed further, lest it should be supposed that the people were invited on the occasion for a different purpose than that of hearing the Proclamation, he adjourned the meeting, with simply adding that the new Society's existence

be dated from that day—being the day on which Her Majesty assumed the Imperial Government of India.

Proceedings.

According to previous announcement, a meeting of the principal inhabitants and residents of Balasore was held in the private residence of the Collector, on the 22nd November last, at 12 o'clock P. M.

The Chairman opened the proceedings by stating that we have met to-day for the purpose of organizing an Agricultural Society in this district. The necessity and object of such an institution have been fully and clearly described by Baboo Puddolochun Mundul in his able address read to you on the day of the Proclamation—a translation of the address will be found on the table. Baboo Puddolochun has shown much public spirit in taking the initiative in this laudable undertaking; and his efforts, I am glad to observe, already prognosticate success, for he has secured, as you will perceive from the subscription book, a considerable fund to enable us to begin operations. We can now proceed to name the Society and elect a Secretary.

Baboo Puddolochun Mundul laid on the table the correspondence that had passed between him and the Secretary to the Agricultural Society in Calcutta, on the subject of forming a Branch Society in Balasore. The Baboo, in his letter dated the 19th September last, mentioned to the Society the desirableness of directing their attention to the improvement of agricultural interests in distant and destitute districts, and requesting instructions as to the best mode of supplying the desideratum in Balasore.

The Secretary, in his reply to the Baboo, under date the 9th October last, communicated a resolution of the Society, in which they expressed their willingness “to co-operate with the Baboo in any practical suggestions he may make in regard to improvements in his district; and proposed that he and the other wealthy and influential zemindars at Balasore form a Branch Society, to co-operate with them for the introduction of useful seeds and plants, and for such other purposes as may be suggested with the view of attaining the desired object.”

Resolved—That, agreeably to the above kind offer of the Calcutta Society, our Society be designated “the Branch Society of Agriculture and Horticulture at Balasore.”

Proposed by Mr. Schalch, and seconded by Dr. Kendall, that Baboo Gour-doss Bysack be the Secretary. Carried *nem con*.

Resolved—That Baboo Puddolochun Mundul and the Secretary form into a Sub-Committee, to prepare and submit to the Society, at the next meeting, a Code of Bye-laws, and plan of operations that may be necessary to adopt for accomplishing the object in view.

Resolved—That a copy of the proceedings be forwarded for the information of the Parent Society in Calcutta, with a request that they may state in what shape and extent they are willing to aid and co-operate with the Branch Association.

The meeting separated with a vote of thanks to the chair.

V. H. SCHALCH,

President.

Resolved—That the Society have heard with much pleasure of the establishment of a Branch at Balasore, and that the Council be requested to report on the nature and extent of the assistance that can be rendered in reference to the fifth paragraph of the Secretary's letter.

Communications on various subjects.

The following letters were also submitted :—

1. From R. B. Chapman, Esq., Officiating Under-Secretary to the Government of India, forwarding a report on the silk experiments at Lahore, by the Financial Commissioner of the Punjab. (Transferred for publication in the Journal.)

2. From James Cowell, Esq., Avignon, dated 2nd October, advising despatch of a quantity of French madder seed. The following is an extract of Mr. Cowell's letter :—

"In compliance with the request made to me, when leaving Calcutta, to endeavor to procure and send you some madder and other seeds, I write now to inform you that I arrived here from Marseilles on the 17th instant, having learnt at that port that the seed of the 'garance,' or madder plant, could be obtained here of better and more reliable quality than elsewhere. I have, I believe, succeeded in the object of my visit, having purchased, through the kind assistance of an English merchant here, 50 kilogrammes (about 112 lbs.) of fine fresh seed (just gathered), and which I have requested Mr. King to send to my agents, Messrs. Salvy and Co. of Marseilles, for transmission to you in a case, *via* Malta, by the P. and O. Company's steamer leaving that island about the 1st or 14th proximo. The case will be directed to you. Please apply for it immediately on arrival, and distribute the seed as soon as possible to such members of our Society in Upper India as will take any pains or interest in the cultivation of so valuable a root.

"The seed is sown here in the spring months (March, April, and May), but I think January and February will be the most suitable time for sowing in India. The hill localities will probably be the best for experiments, with a temperature of 60° to 80° Fahrenheit. The soil should be well and thoroughly loosened, and of a light nature. In Upper Sindh, and in the Punjab and Neilg herries, I think it is very likely to succeed, or that the chance of success

is greater there than in the lower provinces. The soil may be dug up after 12 or 15 months, and should then be dried in the sun; when dried, it has very much the appearance of our munjeet. Four cwt. of the fresh green root gives, when dried, 1 cwt. of the merchantable commodity. In this province the dried root is reduced to a powder by rollers, with the view of saving in freight, and this powder (garance) is then shipped largely to England, United States, &c.

"I fear there is no use of my sending you any seeds of the olive. The plant is produced from cuttings, and not from seed. I will see what I can do when I come this way again, or in Italy (Naples), where the olive is abundantly grown, and of the finest quality, and I will send you, if I can, some 'cuttings. The Valonica seed or acorn I will endeavor to obtain from Trieste or Smyrna.

"I have deemed it best to send you a large supply of the madder seed, as we may not again have an opportunity of procuring it under such favorable circumstances. I hope you will succeed in establishing this valuable article as an export from India. You may know that I have for some years past interested myself in this object.

"The Lahore Agricultural Society should be supplied immediately with this seed, and Mr. Cope's best attention should be solicited to its cultivation, which is simple and inexpensive. Directions for planting, &c., I have requested should be sent to you in the box."

Resolved—That the best thanks of the Society be communicated to Mr. Cowell for his kind and prompt attention to the Society's wishes; that the seed be distributed in the manner suggested, and to such other members as may express a desire to try it in suitable localities.

3. From C. B. Wood, Esq., reporting on the stick lac received from Mr. J. L. Atkinson of Cuttack, and submitted at the October meeting.

Agreed that a copy of this report be sent to Mr. Atkinson for his information.

4. From Captain W. H. Lowther, Suddya, dated 28th October, advising the despatch of the *Momordica* seed previously alluded to, and offering a few interesting remarks on other subjects:—

"Your 'red-flowered *till*' is now in full blossom, and promises an abundant crop; the pods are now swelling; it bids fair to be a dangerous rival in the market to the common country small-seeded description. People from all parts come to look at the field, and carry off the flowers to their homes as curiosities, so pray let me have a good supply of this seed when you can spare it, and get an opportunity, *i. e.* by June next. Only fancy the common country is just now realizing 3 to 4 annas per seer at Deebroghur, and little to be got: the demand immense, as an edible commodity. Both your batches of vegetable seeds have proved A 1 in quality. I never before saw so large a per-centage germinate at the same great distance from the sea; at least 60 per cent. of most descriptions are now healthy plants, past all risk. I thought the

growth of every thing quite wonderful. Did this extreme vitality originate with the *Comet*, or from atmospheric electricity prevailing in force at the period of sowing? The springing up of the cabbages, lettuces, endive, tobacco, gourds, &c., was almost magical, and the natives all declared I watered the seeds with some wonderful water from my *Dewaie khunah*. And now of the *Pierardia*. I find from the natives, with whom the 'lutkoo' is the favorite fruit, that not *one* seed in one hundred is sound or can be depended upon to vegetate, which is a pity I think, for, as I wrote before, it would be an addition to our dessert, under high culture. In opening a large packet of the seed I had made up for future transmission, I discovered that the native statement is quite correct, *not one* could I find in a mature condition. A servant of mine, who has a large tree of the *lutkoo* near his house at Debroo, assures me that, out of the thousands of seeds dropped there during many years past, the produce has been but two trees. I will make further researches in this matter, and let you know the result. I have lately been exploring some ancient ruins of cities in the very heart of our frontier forests (places now the dark abodes of tigers, Mishmee marauders, and jungle fever), and was delighted with the vegetation in the immediate vicinity of these relics. It had sprung entirely from the cultivated order of trees and plants—*Garcinias*, *Mesua*s, citron worts, *jasminums*, &c., &c. The beds of the streams being almost paved with the brick and stone debris of palaces and temples, and the more humble fragments of domestic vessels of yore, of the classic times of Koondelpore and Sissoopalnuggur, famous in Hindoo story. I am now sending you some newly gathered seeds of a very pretty '*Cucurbit*,' highly popular in Assamese cookery as 'Bat Kurreela,' so named from its outward alliance to the latter vegetable. This one, however, by cultivation, becomes deliciously palatable, and is as good and as wholesome as any plant of the order I know; but this is not the only quality—as a decorative climber in the fullest sense, where both nature and art work together, it is lovely; the foliage, the blossoms, the fruit, all well adapted to either ornament or design in reality, in wood, in stone, metal, or on paper. This found, when ripe, is orange colored, beautifully beset with spines like a hedgehog. In *Wight's Prodomus* I think you will recognize it as *Momordica mixta*, a perennial with a tuberous root: this root the natives plant out like yams. I will send you some of the cultivated seeds in my next: I think, but I am not quite certain, that I met with the plant once in a garden in South Bundelcund. This *Momordica* should have a sheltered situation under a row of maize, tall beans, &c. It should have morning and evening sun though, and plenty of rain. *Cucurbitaceæ* constitute a large proportion of our local flora. I shall send you the *handsomer* species in due season. Our gourds of edible species are few in number, and mainly contribute to feed the pauper classes—they are all suited to the European taste, however, when very young, and at a season when no other vegetables are procurable. The

want of labor in our province is greatly to be deplored ; it is truly a land flowing with milk and honey. No other spot of similar extent in the whole world can produce such varied treasures, be they animal, vegetable, or mineral : merely want a thoroughfare and inhabitants.

" I am just now superintending the clearing and guarding of a site near the great Dibong River, for the site of a fortlet, which is to hold in check those prowling marauders, the Mishmees of the mountains, by whose hands not a few villagers have been surprised and murdered within the last two years. We shall thus, in time, reclaim the magnificent lands surrounding those ancient cities above described, the richness of whose soil I cannot describe to you—tea, coffee, cotton, cane, indeed everything of commercial value would flourish there ; but where is the market, and where the roads, or the steam-bonts, rather ?"

5. From Mr. C. Sharp, Superintendent of the Barrackpore Park, the following note of his mode of cultivating the American maize, of which he submitted such fine specimens at the last meeting :—

" The maize (or Indian corn) I sent you was from the Society's American seed of 1857, and planted out between rows of cabbages in December 1857 ; as the corn came up, the cabbages were cleared away.

" Irrigation was carried on every fifteen days, until the plants showed flower, and then discontinued—the seed ripe in March 1858. The seed, a portion only from the aforesaid produce, were sown in June last, and the cobs I sent you are part of the produce of the June sowing.

" I have still about half a maund of such seed as I sent you for distribution to natives or other parties requiring it.

" My space for such things is limited, but, as an experiment, I will try this year's American in the same way, and let you know the result in due course."

6. From Lionel Berkely, Esq., Delhi, announcing that the vegetable seeds (Carter's overland trial assortment) have succeeded well in his garden, but that the fruit seeds have failed.

It was agreed, on the recommendation of the Council, to appropriate the sum of Rs. 160 towards the purchase of a set of *Curtis's Botanical Magazine*, which had been offered for the Society's Library.

A few copies of the Society's Journal, Vol. X., part 2, just received from the press, were placed on the table.

For all the above communications and presentations the best thanks of the Society were accorded.

R E P O R T

OF THE

Agricultural and Horticultural Society

OF INDIA.

*Report from the Council to the Annual General Meeting of the
12th January, 1859.*

The Council beg to submit their usual Annual Report.

The subscription list and financial department first claim attention.

The Council are glad to announce that the number of elections during 1858, has been 102, considerably exceeding the general average (76) of the previous 12 years. It is also satisfactory to add that the deaths have been considerably less than in 1857, namely eighteen only.*

The following list shews, in detail, the present constitution of the Society:---

* The Honorable Major R. Byng; Lieutenant-Colonel J. G. Gerrard; the Right Rev. Dr. Wilson, Lord Bishop of Calcutta; Baboo Russickissen Mullick; Mr. J. C. Strover; Lieutenant-Colonel H. Garbett; Messrs. H. E. Cockerell, c. s.; J. R. Grey; E. F. Flouest; H. M. Low; C. C. Jackson, c. s.; A. Larruleffa; T. C. Loch, c. s.; D. H. Freeland; G. L. Young; Major W. Abercrombie; Captain F. C. Jackson; and Dr. Forbes Royle.

CLASSIFICATION.	In 25 previous years.	In 1846.	In 1847.	In 1848.	In 1849.	In 1850.	In 1851.	In 1852.	In 1853.	In 1854.	In 1855.	In 1856.	In 1857.	In 1858.	Gross Total.	Total real number at close of 1858 after deducting lapses.
Honorary Members, ..	11	1	0	1	0	0	0	1	0	1	0	2	0	0	17	10
Associate Members, ..	2	0	0	0	0	1	1	0	0	0	0	0	0	0	4	3
Corresponding Members, ..	0	1	0	0	0	0	1	1	1	0	0	0	0	1	5	4
Civilians, ..	232	13	15	22	8	10	22	16	12	6	23	23	17	19	444	166
Merchants & Traders, ..	201	14	12	13	10	14	20	12	5	16	18	31	11	20	397	130
Indigo and other Tropical Agriculturists, ..	190	15	6	5	1	9	19	13	10	7	14	12	10	14	325	106
Military Officers, ..	160	10	11	11	11	9	34	18	22	19	26	22	12	14	379	130
Medical Officers, ..	80	0	2	3	5	7	4	5	3	4	6	9	3	3	134	28
Asiatics, ..	63	2	14	5	6	9	8	8	8	5	5	7	14	19	173	71
Clergy, ..	14	1	0	0	0	2	1	1	1	1	2	1	2	0	26	9
Law Officers, ..	40	1	0	0	6	4	6	3	1	3	6	2	1	5	78	27
Miscellaneous, ..	9	0	2	0	2	2	6	0	0	10	0	0	2	7	40	30
	1002	58	62	60	49	67	122	78	69	72	100	109	72	102	2022	713

The lapses alluded to in the last column comprise, as above mentioned, 18 deaths, 42 resignations, and 8 removed from the list in accordance with Section VI, of Chapter III, of the Bye-Laws, the limited period of absence from India (4 years) having expired, making in all 68.

Of the total number of members (713) introduced in the last column, 33 have compounded for their subscriptions, 106 are absent from India, and 17 are Honorary, Associate and Corresponding; in all 156; leaving 558 as the actual number of paying members at the close of the year.

Among those who have been lost to the Society by death, the Council have to record with much regret the name of Dr. Forbes Royle, for 17 years an Honorary Member. The unceasing interest which Dr. Royle evinced in most questions connected with the

*It should be 104, the names of Mr. G. D. Turnbull and Col. W. J. B. Knyvett having been erroneously introduced in the obituary list of 1857.

development of the productive resources of this country, naturally led him to take an active part in the various subjects continually coming before the Society, and to forward its views to the best of his ability: The loss of a Member and Correspondent who has assisted so much towards the advancement of Indian agriculture and horticulture is most severely felt and deplored.

The financial position of the Society may also be regarded as altogether satisfactory, as the annexed statements will shew. From these it will be seen that the total receipts during the year have been Rs. 31,509-7-6, and the disbursements Rs. 30,681-4-9. The total liabilities amount to Rs. 9,400. To meet this there is the amount due for arrears of subscription, for seeds, plants, &c., and the cash balance, forming a total of Rs. 13,157.

Only two exhibitions were held during the year, the occupation of the Town-Hall by troops not admitting of the third being held, as usual, in the month of April. The Horticultural department of the January show was deemed altogether very satisfactory, and the competition in the floricultural department was greater than at the January show of 1857; and at the March show the display of vegetables and fruits was equally as good as that of March of the previous year, and the collection of ornamental plants far better. There was a large attendance of visitors at both shows, especially at the first. The sum of Rs. 878 and 4 bronze medals were distributed on these occasions.

The importation of vegetable and flower seeds from England, North America and the Cape of Good Hope, appear, on the whole, to have afforded satisfaction. A second trial assortment of seeds of field crops from Messrs. Gibbs and Co. of London, have however, the Council regret to add, proved so decided a failure, that they have recommended that the order for 1858 be given to Messrs. Carter and Co., and that a small additional supply of cereals be obtained from Messrs. Villet and Son of the Cape.

The Society have been called on during the year to meet certain applications for seeds for soldiers' gardens, to which they have responded to the best of their ability. In reply to a reference

previously made on the subject, it was stated that the Right Honorable the Commander-in-Chief did not consider it necessary, under the then existing circumstances, to avail of the Society's offer of obtaining seeds for soldiers' gardens; but, as demands were, notwithstanding, preferred for certain localities, the Council have thought it desirable to cause another enquiry on the subject to be made to the Military authorities, as it is not improbable that applications on a larger scale will be preferred for next season, which the Society may not be able to meet to the required extent from their own resources.

The Society have disseminated agricultural seeds in various quarters, more especially to Captain Stewart, the Officiating-Superintendent of Cachar, to whom they have sent a large supply, and the distribution of which he reports as a great success among a class of people who have been hitherto dependent on one staple only, rice, which proved a failure last year in Eastern Bengal generally, causing much misery and destitution.

From the Cotton Supply Association of Manchester the Society have received a ton of New Orleans cotton seed, which they have been distributing as judiciously as possible, on the understanding that the recipients communicate in due course the result of their sowings. A small quantity sown in the Society's garden has germinated readily.

It was stated in the last report that though the demand for plants during 1857 had exceeded all previous years, except 1856, it would no doubt have been greater, but for the unsettled state of the country. The operations of 1858 have proved the correctness of this remark. A statement submitted by the Officiating-Gardener shews that from 1st January to 31st December, 1858, nearly 19,433 plants have been distributed, being an increase of upwards of 6,000 on the distribution of 1857. In this number are comprised nearly 7,000 fruit grafts and trees, and a quantity of other useful plants such as coffee, vanilla, &c.; while the remainder (9,604) is made up of purely ornamental plants. During the past year 192 delivery orders have been granted, against 146 in 1857.

In addition to the above, it should be mentioned that the distribution of plants beyond sea has considerably increased. Forty-eight

glazed cases have been transmitted to various places as per subjoined statement :—

To England, by overland steamers, by steamers and sailing vessels viâ the Cape,	14
To Mauritius, principally by sailing vessels,	7
To Penang, by steamers on the China line,	3
To Rangoon, by the Burmah Steam Navigation Company's steamers,	16
To Moulmein by ditto,	2
To Arracan by ditto,	6
Total, ..	48

Besides 4 cases to Assam by the Government steamers. A few more cases are also in hand to be forwarded in January.

The above-mentioned increase in the distribution has necessarily augmented, in a proportionate degree, the work in all departments of the Garden. For propagating in the ornamental department it has been found necessary to introduce *cutch* beds in addition to the old *pucka* ones; they have proved useful auxiliaries, and been found to succeed remarkably well, at a trifling expense, for plants of a *robust* character, by choosing cool and tolerably dry localities. In this manner many kinds of roses have been freely propagated; also the beautiful green-striped bamboo of China and the gigantic bamboo of Burmah. Mr. Manuel has been successful in raising *Araucarias* from cuttings, which, with the fine *Thuja* species and the beautiful *Cupressus funebris*, propagated from plants and seeds received from Mr. Fortune in 1855, have been distributed to a limited extent. There has been a good demand for *Amherstia nobilis*, of which 72 plants have been distributed in the course of the 12 months. An equal number was almost ready for distribution, when the gale of the 25th October took place, and destroyed half of them. Notwithstanding the extended call on the garden, there is still a large stock available for distribution; about 15,000 plants.

From the Orchard department, though the distribution has been active as already noticed, there is still a good supply on hand to meet demands during the early part of 1859 of various kinds of fruit grafts. Among others, the Mauritius mango may be mentioned,

which has been thriving exceedingly well; several plants of Nutmeg and Mangosteen from the stock contributed in 1857 by Mr. Anthony of Penang, have been removed from pots, and planted out in suitable spots, where they are now thriving well. The Manilla hemp plant (*Musa textilis*) is now being freely propagated, and several plants have been distributed: these derive their origin from a single plant presented by Mr. Ackland in 1853: the older plants blossomed during the past season, but did not produce any fruit. Another plant, the "Woondée" of the Deccan (*Callisacion longifolium*), which has been many years in the garden, having been presented by Mr. R. Chew so long ago as 1839, blossomed, it is believed for the first time, this year. This tree yields a luscious fruit differing in taste from any on this side of India. Several seedlings have been raised, and grafts prepared. The fine betel-nut and cocoa-nut plants presented by Mr. Joseph Agabeg in 1850 have also recently blossomed, which will probably give a good supply of fruit for propagating purposes. The Carob (*Ceratonia siliqua*) raised from seed presented by Mr. Henry Abbott of Cairo in 1844, also blossomed last year for the first time, but did not perfect its fruit. A large number of seedlings of this valuable tree is now in stock from seed received from England in 1857. Several other plants in this department might be alluded to, but that it would swell out this report to an inconvenient length.

In the department of economic products, due attention has been accorded to various fibre-yielding plants (7 in number), to yams of sorts, including those from China, and New Zealand; also arrow-root, tapioca, ginger, sugar-cane, Guinea-grass, ground-nuts, (*Arachis hypogea*) vanilla, cotton, &c. The pods from *Vanilla aromatica* and *planifolia*, to which allusion was made in the last report, as having been sent to the London Society of Arts, have been favorably reported on (see *Journal*, Vol. X. p. 115.) In addition to the three plots previously under cotton, two others have been recently laid out with plants raised from seed, presented by the Government of India, with plants raised from the Sea Island and Petti-gulph seed received from the Society's seedsmen at Philadelphia, and plants from New Orleans seed presented by the Manchester Cotton Supply Association. All the available space in

the kitchen garden is fully appropriated: besides the ordinary vegetables, a good extent of ground has been laid out with American maize, and a still larger plot (nearly 70,000 square feet) with peas of all kinds, to meet a probable large demand next season for soldiers' gardens, and elsewhere.

The Council regret to mention that there has been no demand for the Chinese green dye plants, though frequently brought to notice: there is a large stock of this useful plant still on hand, for those who would wish to cultivate it for the sake of the color it affords, and which is now so highly valued in Europe, more especially in France, where the dye has been recently selling as high as Rs. 135 per pound!

The Society are indebted to several contributors during the past year, more especially to Dr. Thomson, Superintendent of the Botanic Garden, Calcutta, to Captain Ledbitter of the "Swathmore," to Captain F. W. Ripley of Arracan, Captain E. H. Power of Rangoon, and Mr. W. Stalkartt.

The Society has been in correspondence during the year with the Right Honorable Sir Lawrence Peel, regarding a Gardener. Sir Lawrence has secured the services of a competent person, who will probably arrive in the early part of 1859.

It was stated in the last Report that the time expired on 31st December, 1857, for which prizes had been offered for certain staple articles, for efficient substitutes for others, and for essays on certain subjects. It was agreed at a meeting in the early part of 1858 to extend the time to the 31st December, 1858, in consequence of the promotion of the special objects of the Society having been considerably impeded during 1857, owing to the disturbed state of the country. At the following meeting the Special Committee submitted a revised list of premia, omitting a few articles and substituting two others, namely for the successful introduction and cultivation of madder (the produce of *Rubia tinctorium*) and for a cheap substitute for gunny-cloth for packing purposes. There has been no competition during the past year for the prizes offered for staple articles, and only one essay has been sent in, which is under adjudication.*

The Society have received during the past twelve months many samples of various articles, such as coffee, tea, cotton, vanille, gamboge, resins, gums, farina as substitutes for arrow-root and tapioca, fibres of sorts, &c., on most of which reports have been furnished by the respective Committees to the contributors. It may here be stated that some interesting information has been published in a recent number of the *Journal* respecting an useful substance from the Tenasserim Provinces called Pwainyet, and the little bee which produces it, collected from notes furnished by the Rev. Mr. Parish of Moulmein and Mr. F. Smith of the British Museum. The substance itself which, it is probable, might be applied to several useful purposes, has been forwarded to the Society of Arts for examination and report.

• It is gratifying to announce the recent establishment of a Branch Society at Balasore. It has been originated by a member of the Society, a native Zemindar, Baboo Puddolochun Mundul, who is much interested in the improvement of the vegetable resources of the district. Judging from the report of the preliminary proceedings which were submitted at the December meeting, this Branch Institution promises well, and can scarcely fail to prove most useful, if the steady co-operation of the other leading landholders can be secured.

Among other subjects that have engaged the attention of the Society during the past year, the Council would wish to record, more especially, that advantage has been taken of Mr. R. Fortune's return to China in the service of the Government of the United States of America to re-open a communication with him. Previous reports, particularly those of 1854 and 1855, record the benefits experienced by the Society on a former occasion through the agency and zealous co-operation of Mr. Fortune. Mr. Fortune has again kindly promised to use his best endeavours to obtain seeds and plants from China, and the Superintendent of the P. and O. Company, Messrs. Jardine, Skinner and Co., Gladstone, Wylie and Co. and Apear and Co., have most liberally expressed their readiness to allow such cases to be forwarded free of freight by the steamers for which they are

Agents. A communication has also been opened with Dr. Walker, Superintendent of Port Blair, to whom a quantity of seeds has been supplied for the use of the convicts in the new settlement of the Andamans, and he has already commenced to reciprocate by the despatch of plants from those Islands. Application has likewise been made to Dr. Livingstone, for seeds and roots of such African plants as he may consider desirable for introduction into India.

The Society have recently voted a silver medal, with a suitable inscription in Persian, and a parchment certificate, to Juffer Allee, a resident of Darree, in the Pergunnah of Shukurghur, Goordaspore, as the first zemindaree planter of mulberry trees in the Punjaub, for rearing silk-worms.

Monsieur Natalis Rondot of Paris, the author of a most interesting and useful treatise on the Chinese green dye, has been elected a Corresponding Member of the Society.

Lastly, the Council have to report, that during the past year two numbers of the *Journal* have been published, viz. in June and December, both containing several interesting papers, among others notes on the indigenous plants of Bengal; on experiments with cross-breeds of the silk-worm; on the culture of English vegetables in the environs of Calcutta; an account of the silk trade and silk manufactures of the Punjaub, and on the introduction of the silk-worm into that province; the production of palm sugar in Pegu; the progress of tea cultivation in Cachar and Darjeeling; on the introduction of the quiniferous Cinchonas of South America into India; and various reports on tea, coffee, oils and fibrous materials.

Statement of Receipts and Disbursements of the Agricultural and Horticultural Society of India from 1st January to 31st December, 1858.

RECEIPTS.

From Members, Subscriptions collected during the year,	Co.'s Rs.	17,241	11	6
„ Government Annual Donation,	5,000	0	0	
„ The Right Honorable Lord Canning's annual donation for the year 1858,	500	0	0	
		5,500	0	0
„ Accruings of interest on Government Notes,		813	5	4
„ Government of Bengal for 26 cases of seeds supplied by Messrs. James Carter and Co. on account of Soldiers' Gardens,	3,677	4	8	
„ Secretary A. and H. Society, Punjab, for 2 cases of English vegetable seeds supplied in 1857,	110	0	0	
		3,787	4	8
„ Proceeds of Sugar-cane delivered from the Nursery Garden,	178	4	0	
„ Ditto, fruit grafts delivered from the Nursery Garden,	994	4	6	
„ Ditto, of a proportion of surplus Cape and American vegetable and English flower seeds of 1857-58,	1,590	1	6	
„ Ditto, of English vegetable seeds,	191	0	0	
„ Ditto, of sale of 24 Mds. and 19 seers of Linseed,	59	10	3	
„ Ditto, of sale of 5 Mds. and 10 seers of acclimated peas,	95	0	0	
„ Ditto, of <i>Journal</i> of the Society,	68	8	0	
„ Ditto, of <i>Indian Agricultural Miscellany</i> ,	29	10	6	
„ Ditto, of sale of old seed boxes and casks, &c.,	54	12	0	
„ Members, amount repaid for postage, pots, and packing charges for seeds, &c.	649	14	3	
„ Ditto, for glazed cases, &c.,	191	8	3	
„ Ditto, amount repaid for freight on boxes of seeds forwarded in 1857-58,	63	4	6	
		4,165	13	9
„ John Cochrane, Esq. Official Assignee, being a further dividend on the Society's claim of Co.'s Rs. 100 against the estate of Messrs. Saunders, May, Fordyce and Co.,		1	4	3
Total Receipts, Co.'s Rs.,				
		31,509	7	6
By Balance in the Bank of Bengal on 31st December, 1857,	2,145	7	5	
„ ditto in the hands of the Secretary on ditto,	15	3	0	
		2,160	10	5
Grand Total, Co.'s Rs.,				
		33,670	1	11

DISBURSEMENTS.

FOREIGN VEGETABLES AND FLOWER SEEDS.

By Messrs. C. M. Villet & Son for Cape Garden seeds supplied in 1858,	1,888	0	0
„ Messrs. D. Landreth and Son in part for American Garden seeds, &c., supplied in 1857,	1,000	0	0
	2,888	0	0
Carried over, Co.'s Rs.,			
	2,888	0	0

Statement.

clxxxv

	Brought forward, Co.'s Rs.,	...	2,888	0	0
„ Messrs. James Carter and Co. in full of their bills, amounting to £306-13-3 for English vegetable, and flower seeds, &c., supplied in 1857,	...	...	3,066	10	0
„ Messrs. Thomas Gibbs and Co. in full of their bills amounting • £107-8-3 for seeds of field crops supplied in 1857,	...	...	1,074	2	0
„ Messrs. James Carter & Co. in full of their bills amtg. £367-14-7 for 26 cases of seeds supplied for Soldier's Gardens,...	...	...	3,677	4	6
„ Sub-Treasurer for a box of seeds intended originally for Soldiers' Garden at Dum-Dum, but taken over by the Society,	...	...	20	0	0
„ Messrs. Rabaud Brothers and Co. (through Messrs. Charles Cantor and Co.) for a box of olive seeds,	...	...	9	5	6
					<hr/> 10,735 6 0.

LIBRARY.

By Books purchased during the year for the Library,	...	...	366	7	9
„ Binding books during the year,	...	...	17	12	0
					<hr/> 384 3 9

PRINTING.

By sundry parties for printing receipts and schedule of prizes for flower shows, &c., &c.,	38 8 0
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JOURNAL.

By Bishop's College Press, for printing, &c., 700 copies of Journal Part, 1 Vol. 10 of the A. and H. Society, including a General Index of the Transactions and Journal,...	892 12 0
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NURSERY GARDEN.

By Ordinary expences incurred on account of the Nursery Garden from 1st December, 1857, to 30th November, 1858,	3,841	11	0
„ Extra ditto, for purchase of fruit seedlings for grafting, for glazed cases, pots, for widening and repairing roads, for thoroughly repairing old conservatory, building a new one, and for sundry other contingent expences,	...	...	1,692	11	9
„ Messrs. Charles Cantor and Co. for letter of credit to Sir Lawrence Peel for Gardener's passage money, &c.,...	...	...	1,043	9	0
„ Messrs. Gisborne and Co. for supplying 3 casks of Guano,	...	...	146	2	6
„ Half maund of Jerusalem Artichoke tubers for the Society's Garden,	...	...	3	0	0
„ Messrs. G. F. Lackersteen and Co. for 2 wheel-barrows, &c.,	...	...	53	0	0
					<hr/> 6,780 3 0

ESTABLISHMENT.

By Amount for establishment from 1st December, 1857, to 30th November, 1858,	8,557 4 0
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PECUNIARY REWARDS.

By Prizes to Mallees for vegetables and fruits at exhibitions held on the 29th January, and 10th March, 1858,	577	0	0
„ Ditto to ditto, for flowers at ditto, on the 29th January, and 10th March, 1858,	...	...	301	0	0
					<hr/> 878 0 0

ADVERTISEMENTS.

By Advertising notices of general meetings, of shows of vegetables and flowers, distribution of seeds, offer of premia, &c., &c.,	...	...	...	...	83 15 0
					<hr/> 83 15 0

Carried over, Co.'s Rs., ... 28,550. 2 9

STATIONERY.

Brought forward, Co.'s Rs., ..	28,550	3	0
By Stationery for office books, &c., and for the use of the office, ...	77	14	0
„ Brown packing paper for packing seeds,	97	10	0
			<hr/>
			175 8 0

FREIGHT.

„ Freight on boxes of seeds, books, &c., sent and received from the Cape of Good Hope, America, &c.,	348	0	0
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METCALFE HALL.

„ Society's proportion of assessment on the Metcalfe Hall from October, 1857, to September, 1858,	157	8	0
„ Ditto of ditto for lighting tax from Oct. to September, 1858, ...	42	0	0
„ Messrs. Modosuden Roy for Society's proportion for inspecting and looking over the Metcalfe Hall Building from April, 1857, to March, 1858,	20	0	0
			<hr/>
			219 8 0

FURNITURE.

„ Administrator-General for a portrait of Sir Lawrence Peel, ...	100	0	0
„ Mr. DeLaHogue for cleaning and varnishing the likeness of ditto,	32	0	0
„ Gones Doss for repairing gilt frame of ditto,	10	0	0
„ Sundry articles of furniture,	43	9	0
			<hr/>
			185 0 0

PETTY CHARGES.

„ Sundry charges, including postage on letters, &c., sent and received, and for copies of the Journal,	604	8	0
„ Extra writer and packermen for subdividing seeds, and writ- ing on papers,	34	4	0
„ Soldering tin boxes and lining wooden boxes with tin, sent to Non-Resident Members,	50	1	3
„ Expenses incurred in putting up a fence round a portion of the Auckland Circus, &c.; for superintending the erection of tents for flower and vegetable shows for the season, ..	151	11	0
„ Presents to constables for attending at Horticultural and Floricultural Exhibitions during the year,	64	0	0
„ Mr. Bartlett for illuminating the two Gates of the Metcalfe- Hall on the day of the proclamation of the assumption of the Government of India by Her Majesty,	175	0	0
„ Messrs. Grindlay and Co., being balance due to them as per account dated 11th and 31st December, 1857,	117	14	6
„ Secretary Bank of Bengal for renewing notes, and for fees and commission,	5	0	6
			<hr/>
			1,202 7 3

Total Disbursements, Co.'s Rs., ...	30,681	4	0
By Balance in the Bank of Bengal on 31st December, 1858, ...	2,973	2	2
„ Ditto in the hands of the Secretary on ditto,	15	11	0
			<hr/>
			2,988 13 2

Grand Total, Co.'s Rs., . 33,670

Statement.

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MEMORANDUM.

DISBURSEMENTS.		RECEIPTS.	
To Amount of Disbursements during the year 1858, as per Statement, ...		By Amount of Receipts during the year 1858, as per Statement, ...	
Balance in the Bank of Bengal on 31st December, 1857, ...	30,681 4 3	Balance in the Bank of Bengal on 31st December, 1857, ...	31,599 7 2
Ditto in the hands of Secretary on ditto, ...	2,973 2 2	Ditto in the hands of the Secretary on ditto, ...	2,145 7 5
	15 11 0		15 3 0
	2,988 13 2		2,160 10 7
Total, Co.'s Rupees,	33,670 1 11	Total, Co.'s Rupees,	33,670 1 11
LIABILITIES.		DEPENDENCIES.	
Amount due by the Society for African seeds of 1857-58, ...		Amount invested in Government Securities lodged in the Bank of Bengal, ...	
Ditto for Agricultural seeds from England, received in 1858, ...	6,000 0 0	Ditto of Subscriptions in arrear, ...	20,333 5 5
Ditto for English flower seeds, of 1858, ...	1,095 0 0	Ditto of outstandings for seeds, grafts, copies of Journal, &c., &c., ...	8,469 6 6
	2,305 0 0	Ditto of outstandings for seeds against A. & H. Society, Punjab, ...	1,181 8 6
	9,400 0 0		518 0
			1,699 8 6
			10,168 15 0

